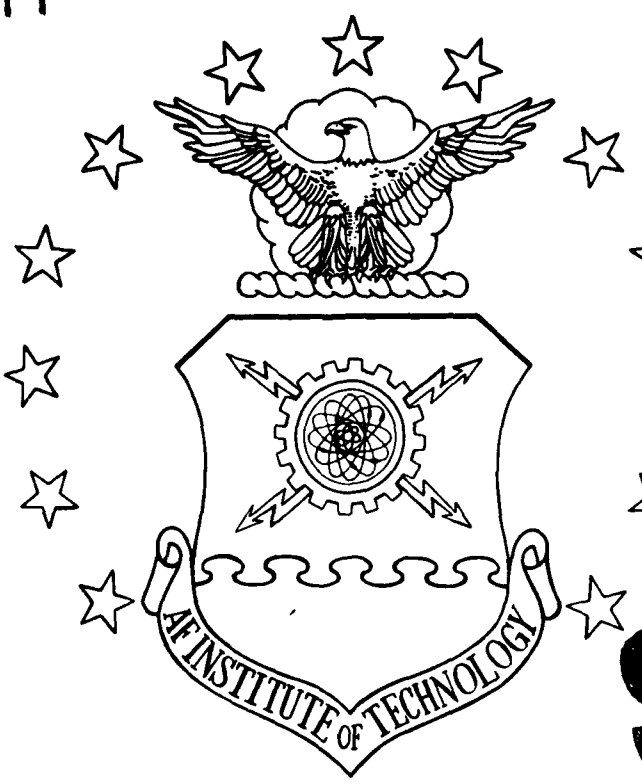
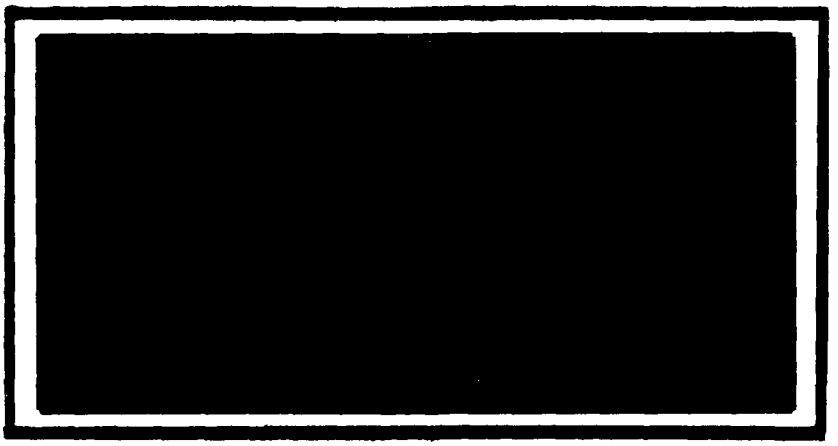




DEPARTMENT OF THE AIR FORCE

AIR UNIVERSITY

AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

AFIT/GIR/LSM/89D-12

THE ROLE OF INTUITION IN THE DECISION-MAKING PROCESSES OF UNITED STATES AIR FORCE FIELD GRADE OFFICERS

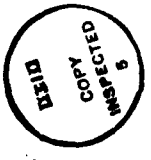
THESIS

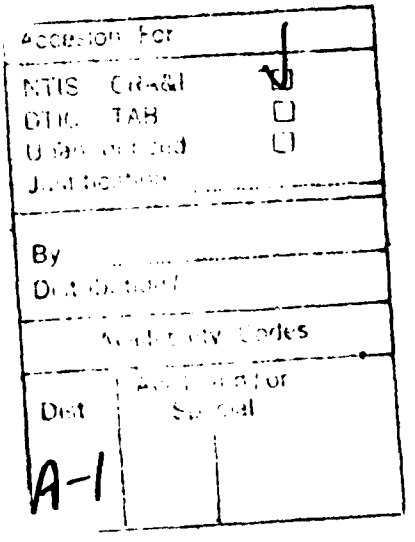
Norman L. Watson

Major, USAF

AFIT/GIR/LSM/89D-12

The contents of the document are technically accurate, and no sensitive items, detrimental ideas, or deleterious information is contained therein. Furthermore, the views expressed in the document are those of the author and do not necessarily reflect the views of the School of Systems and Logistics, the Air University, the United States Air Force, or the Department of Defense.





AFIT/GIR/LSM/89D-12

THE ROLE OF INTUITION IN THE DECISIONMAKING PROCESSES OF UNITED STATES AIR FORCE FIELD GRADE OFFICERS

THESIS

Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Information Resource Management

Norman L. Watson, B.A., M.Dv.
Major, USAF

December 1989

Preface

The purpose of this research was to ascertain the role of intuition in the decisionmaking processes of United States Air Force field grade officers. The hope is that the information obtained from this research will be used as an instrument of awareness and action.

I am deeply indebted to Dr. Dennis E. Campbell, my thesis advisor, whose interest in and diligent support of this effort were second-to-none. Additionally, my special thanks to Dr. Carl L. Davis, Jr., my thesis reader; Dr. Robert B. Weaver, my "Research Methods" course professor and advisor; and Dr. Bruce P. Christensen, my "Statistics" courses professor and advisor, whose insights and recommendations were poignant and timely.

Lastly, I wish to thank Prentice Hall Press for their permission to use elements found in the research instrument of this thesis and Dr. Weston H. Agor, Professor of Public Administration, University of Texas at El Paso, and President of ENFP Enterprises, Inc., for his provocative books and articles on the subject of intuition and decisionmaking which served at the catalyst for this research.

Norm Watson

Table of Contents

List of Figures

List of Tables

Page

Abstract

The study examined the relationship of intuition to creativity and innovation; the impact of that relationship on effective decisionmaking; and the need for creativity and innovation in management and decisionmaking.

A random stratified sample of 304 United States Air Force field grade officers were surveyed. Brain hemisphere preference (i.e., left-, right-, and integrated-brain) in actual on-the-job decisionmaking as well as dichotomous potential ability (thinking versus intuition), which may not necessarily be utilized on the job, were measured via an instrument designed by Dr. Weston H. Agor of the University of Texas at El Paso.

The research determined that Air Force field grade officers are predominately left- and integrated-brain dominant. Characteristically, they use analytical, logical, and rational thinking in their decisionmaking processes and are prone to be more capable of identifying the problem, evaluating the alternatives to the problem, and selecting a solution, rather than at determining alternatives solutions.

Furthermore, the research determined that right-brain dominance is minimal among Air Force field grade officers; typically intuitive ethnic groups have adopted the logical, analytical, and objective cognitive predisposition of the

Air Force environment, though not at identical rates; a right-brain dominant management style is atypical of below-the-zone promotion; there is greater underlying potential intuitive ability than is actually practiced on the job; and other related findings.

Several recommendations were made concerning the need to foster right-brain skills among Air Force field grade officers to more adequately balance the brain dominance of the subject population and to more effectively move that population toward a goal of integrated-brain dominance. That dominance, which selectively use left- and right-brain skills, characterizes managers that make their decisions by use of facts and intuition, after pursuing available information and receiving inputs from the management resources and personnel in an organization. Such is considered the ideal management style.

THE ROLE OF INTUITION IN THE DECISIONMAKING* PROCESSES OF UNITED STATES AIR FORCE FIELD GRADE OFFICERS

I. Introduction

Introduction to the Chapter

This chapter introduces the research problem and details relevant matters such as the research hypothesis, research questions, scope, and limitations. It is designed to ensure that the reader has a sufficiently broad understanding of the intent and value of this research so as to receive the greatest possible benefit from it.

Introduction to the Problem

Professional Foresight. During recent reflections on management, leadership, and command, Lieutenant General Evan W. Rosencrans, USAF, Retired (Former Deputy Commander, United States Forces Korea), concluded that success is not defined just by one's ability in dealing with each

---

Note to Reader: The reader will note that this researcher has consistently used "decisionmaking" and "decisionmaker" as one word constructions. The decision to do so is predicated on the facts that 1) such is the official usage in the Department of Defense and the Organization of the Joint Chiefs of Staff; 2) such is found approximately 20% of the time in the literature; 3) other variants are inconsistent in the literature.

day's challenges, but it is also evident in having "the ability to see beyond tomorrow" (122:7).

Earlier, Colonel James H. Delaney, Director of Administration, HQ USAF, 1983-1985, stated that today's Air Force officer managers will soon lose their credibility if they do not first and foremost realize that our senior decision-makers do not want technocrats giving them book answers, but rather want creative leaders and managers at their sides who clearly see the future and know how to get there (34).

For Delaney, the role of the Air Force manager remains in continual flux, and the demands on managers continue to increase exponentially. Productivity and managerial excellence are inseparable from effective decisionmaking, and within the dynamic arena of leadership and management comes the requirement that Air Force decisionmakers of all functional areas make use of every resource available to them in making the best decisions. For Delaney, the prime catalyst for the adept decisionmaker is a finely honed professional intuition. It is the intuitive Air Force decisionmaker who more clearly sees future possibilities and is able to more productively employ aerospace assets (34).

The Question of Productivity. The United States Air Force is committed to the current Presidential productivity improvement goal of 20 percent by 1992 (106:68). For some, such as Dr. Richard Hallion, that means that decisionmakers must "possess insight unfettered by the constraints of a

technological mindset..." (57:61). For others, such as those in the Strategic Air Command, one way to improve productivity is to "encourage innovation and initiative in finding ways to do our work better and smarter" (106:70). In either case, progressive management thinking and methodology lie at the heart of effective and efficient decisionmaking (40).

Before the information explosion of the 1970's, the American manager was considered to be one of the most progressive managers in the world (54). But by the early 1980's, American productivity had declined to a negative factor (as measured by the Gross National Product) while other nations, such as Japan and Germany, were on continual productivity upswings (19; 94).

W. Edwards Deming, the innovator who taught "quality circles" to the Japanese, attributed 85 percent of the American productivity decline to management problems. Even though American businessmen put the blame on the government, trade unions, inflation, and unfair foreign competition, Deming nevertheless believed that the American manager's inability to solve management problems was the primary reason for the American productivity decline (117:67-70).

For Lehrer, managers are responsible for leadership and motivation; therefore, they and only they are to blame if the job is not getting done (81). Similarly, McKendrick sees ineffective management as the greatest single cause for

low American productivity (94:21-24). Shetty concurs stating, "It is managers--not the government nor the resources--that make an organization productive. Productivity is the ultimate responsibility of the manager" (133:34). For Shetty, productivity is the sole basis of managerial excellence (133:32-37).

The Quest for Excellence. Congress has expressed its intent to provide an Air Force which is capable of preserving the peace and security of the United States and providing for her defense (143). Innovative leadership and management are considered primary catalysts in achieving this goal (106:70). Lt Col David Nothing, Chief, Policy Division, Directorate for Plans, Headquarters, Strategic Air Command, sees the Air Force's answer to effective management and sound managerial decisionmaking as a renewed commitment to excellence. For him, "In this era of fiscal constraints, the task of preserving the peace and maintaining the nation's security requires a commitment to excellence from each man and woman supporting the defense mission" (106:68). For Nothing, the quest for excellence must be accompanied by senior officer support of creative and innovative thinking.

National Security Decision Directives 13 and 178 as well as Nuclear Weapons Employment Policy 84 also clearly reveal an attitude supportive of innovative, creative, and flexible thinking in peacetime preparation for war.

Elements of the Air Force quest can be seen in such initiatives as the Model Installation Program (106:73) as well as in creative planning ideas like the Adaptive Mission-Planning System (131:63), an "expert system" that uses a data base of knowledge and inference procedures to solve some of the Air Force's most difficult war-planning problems.

Ultimately, underlying all Air Force quests for excellence is the following tenant of the Basic Aerospace Doctrine of the United States Air Force:

> For the military professional, there is no simple formula to learn warfighting. Gaining that knowledge is a continuous process that is the product of institutionalized education and training, experience, and personal effort. (36:2-4)

It is this doctrine that implicitly warns against the mediocre, the cavalier, and the status quo, and explicitly points to education, training, experience, and personal effort as a continuous central process in professional development and in the quest for excellence.

Inadequacy of the Status Quo. Goodspeed saw many managers as "blind fanatics" who when they lost sight of their goal, redoubled their efforts (54:18). To survive, said Goodspeed, "we need to stop doing more of the same and begin to challenge old assumptions about information processing" (54:18). For Goodspeed, that change requires a relook at the role of intuition in the decisionmaking process (54:28-30). Leavitt agreed, but went on to

emphasize that analytical thinking was not wrong, only partially complete (79). For Leavitt, the danger is that of accepting a unidimensional decisionmaking methodology in a multidimentional world. He strongly advocated that analytical and intuitive decisionmaking must be joined if American business is to prosper. For him, one's education, training, culture, and experience go hand-in-glove in intuitive development (79).

Mintzberg (98:49-58) found that exceptional managers were those who not only used analytical thinking but intuitive thinking as well in their decisionmaking. He agreed with Goodspeed in that what was currently missing was the intuitive and imaginative half of the balance. "There will be little headway in the field of management if managers and researchers continue to search for the key to managing in the lightness of ordered analysis" (98:57). Barnard went even so far as to say that logic should be subordinate to intuition at the executive level (16).

Decision Sciences and Intuitive Management. Goodspeed, Leavitt, and Mintzberg are supported in their assertions of the importance of intuition in decisionmaking by other researchers in the fields of management information systems (MIS), operations research (OR), management science (MS), and decision support systems (DSS). Though these researchers naturally place major emphasis on the rational

and analytical in their modeling and systems methodologies, they never lose sight of the human judgmental process.

In the conceptual and practical merging of MIS and OR/MS, Keen and Morton state that a manager's judgment is essential in the use of the analytical tools provided by the DSS (72). For them, a decisionmaker's insights and judgments are essential factors during all stages of problem formulation, analysis, and resolution. These factors are intuitive in nature (4; 16; 61; 144). Goldberg agreed stating that "if your only cognitive tools are rational-empirical, your vision will be restricted to what can be analyzed and measured" (51:25).

Zeleny went further in asserting that managerial attitudes and mentality must change. He stated that

> Linear and nonlinear programming, queing theory, inventory theory, critical path, dynamic programming, etc., all have been around right from the beginning. Nothing really has been added to these seminal ideas and concepts. (154:122)

For Zeleny, effectiveness, efficiency, and new ideas are a must. He feels management science's greatest challenge is the enhancement of managerial intuition by new ideas (154:122).

Brain Hemisphere Research. Until recently, intuition, as it relates to right-brain research and decisionmaking, was an untapped frontier. Studies had centered around logical, analytical, and linear thinking processes, especially as logic and reason related to the left-brain.

Researcher such Meyers and Smith (96) and Alpers (12) have striven to change that. Recently they have researched both left-brain (analytical) and right-brain (intuitive) decisionmaking processes, with particular attention placed on the right-brain's intuitive, imagistic, and non-linear thinking processes and the importance of intuition in the decisionmaking process.

Agor (4) in his studies of brain dominance found that many managers admit to using their intuition in decisionmaking without truly understanding it. He created a tool to measure both the use of intuition and logical decisionmaking. Agor has used the instrument to test elements of the American business population, as well as other segments. As a result of his investigation, he concluded that managers should work toward integrating the use of intuition and logic into their decisionmaking. Agor believes this integration would enable managers to make the best decisions based on facts and sound intuition.

Following Agor's lead, Lee stated that some decisions need a logical approach, while others need an intuitive or integrated approach. An astute manager, according to Lee, would know when and how to use the correct mode (80).

The Air Force Decisionmaker. For Air Force field grade officers groomed in the business schools and professional military schools of the 1960's and beyond, logic and reason are the order of the day (51:102). Today's Air Force

officers have therefore presumably assimilated a left-brain dominant perspective (i.e., logical/analytical) in their approach to problem solving and decisionmaking (4:27). Agor has shown that Air Force disaster preparedness officers favor left-brain dominant decisionmaking over right-brain dominant decisionmaking by a margin of two to one (4:27); albeit, they are not necessarily representative of all Air Force officers, and field grade officers in particular. Research conducted by Myers and McCaulley confirms Agor's findings and broadens its applicability to a wider range of Air Force officers (102:253-292). Moreover, Campbell's research at the Center for Creative Leadership in Colorado Springs, Colorado shows that Army officers also demonstrate this same cognitive profile, but to a stronger degree (35:b1).

For Air Force field grade officers to shift their thinking to value intuition as much as logic and reason might seem a radical shift and perhaps even a professional threat. But does intuition have a valid place in the Air Force decisionmaking arena, as the literature would suggest, and should it be deliberately addressed in the professional development of Air Force officers? If so, to what extent are Air Force field grade officers currently using intuition in their decisonmaking processes? Can measures be taken to enhance the decisionmaking potential of Air Force field

grade officers through the development of intuitive abilities? Herein lies the problem.

Research Problem

The problem for this research is to determine to what extent United States Air Force field grade officers use intuition in their decisionmaking processes.

Research Hypothesis

The hypothesis for this research is that United States Air Force field grade officers characteristically use analytical, logical, and rational thinking in their decisionmaking processes.

Research Questions

The following are the research questions that this research seeks to answer:

1. What are the percentages of left-, right-, and integrated-brain dominant management styles of Air Force field grade officers by demographic categories (i.e., in general; by grade, gender, ethnic background, management level, and early promotion profile [below-the-zone promotion])?

    a. Are there statistically significant differences in right-brain dominant management styles by demographic categories?

b. Are there statistically significant differences in integrated-brain dominant management styles by demographic categories?

2. In relation to potential ability,

a. What is the percentage of thinking potential ability Air Force field grade officers in general?

b. What are the percentages of intuitive potential ability Air Force field grade officers by demographic categories (i.e., in general; by grade, gender, ethnic background, management level, and early promotion profile [below-the-zone promotion])? Are there statistically significant differences in intuitive potential abilities by demographic categories?

3. What are the percentages of management type Air Force field grade officers by demographic categories (i.e., in general; by grade, gender, ethnic background, management level, and early promotion profile [below-the-zone promotion selection])? Are there statistically significant dependencies in intuitive-potential-based management types (i.e., left/intuitive, right/intuitive, and integrated/intuitive) by demographic categories?

4. Is there a statistically significant relationship between right-brain dominant management style and intuitive potential ability?

5. Is there a statistically significant relationship between integrated-brain dominant management style and intuitive potential ability?

6. Which Air Force field grade officers, in terms of brain dominant management styles and potential ability profiles, most like their occupation and feel it is right for them?

a. Is there statistically significant dependency between brain dominant management style and occupational satisfaction?

b. Is there statistically significant dependency between potential ability profile and occupational satisfaction?

c. Is there statistically significant dependency between Air Force Specialty Codes (AFSC) and occupational satisfaction?

7. Are there statistically significant relationships between the first four steps of the "Five Steps of Problem Solving," as used in the field survey (Appendix A), and brain dominant management styles?

8. Do the field grade officers with right- and integrated-brain dominant management styles perceive themselves as intuitive?

9. Do the field grade officers with potential intuitive ability profiles perceive themselves as intuitive?

10. What is the opinion of the value of intuition in the decisionmaking process of those surveyed? Is there statistically significant dependency between opinion and management level?

Scope

This research is limited to United States Air Force officers who meet the following two criteria:

1. Hold the rank of field grade (major through colonel).

2. Have received a regular commission.

Field grade officers (36% of the officer force (37:1)) with regular commissions (66.2% of the officer force (37:1)) were specifically singled out as decisionmakers because they are the Air Force officers who are characteristically:

1. Serving as Wing, Base, and other component commanders.

2. Assigned as program managers for major weapon systems.

3. Holding major functional management roles as directors and division chiefs at major command, departmental, joint, and equivalent activities.

4. Categorized as the senior decisionmaking group in which future general officers are groomed, the last stratification (colonels) being the segment from which general officers are selected.

5. Serving as role models for company grade officers.

Limitations

The limitations of this research are as follows:

1. The scope itself is limiting. Company grade officers perhaps could offer more heterogeneity in managerial behavior than field grade officers, albeit they are less experienced.

2. If some respondents are familiar with the testing instrument (Appendix A), their answers could be influenced or biased.

Concerns about the following are satisified as indicated:

1. Concern: Since a survey will be mailed to a random population, only those who choose to return that survey will be studied. This self-selection may influence the results. Response: This concern was statistically accounted for in the sample size, predicted rate of return, and random selection of sample population, detailed in Chapter III.

2. Concern: The respondents to the survey may answer the questions as they think they are expected to do, rather than as they honestly act or believe. Response: The concept of centrality of responses, based on a random sample population, as detailed in Chapter III, overcomes this problem.

3. Concern: Some respondents may wish to purposely prejudice the survey results because of preconceived notions

of how Air Force officers should make decisions. They may therefore deliberately falsify their answers. Response: Same as number "2" above.

Assumptions

The conduct of this research assumes that all subjects surveyed

1. Make decisions.

2. Use their left-, right- or integrated-brains to make decisions.

3. Will answer appropriately.

Definition of Terms

The following terms are defined to add clarity to this thesis:

Air Force Specialty Code. An alpha-numeric code delineating the specific functional area within which an individual officer performs duty (i.e., information management and administration [70XX]; data automation/telecommunications [49XX]; etc.).

Below-the-Zone Promotion. The early promotion of selected Air Force officers who show extraordinary promise and potential for increased grade before their peers.

Brain Style Preference. Preferred method of processing information and making decisions: right-brain, left-brain, or integrated-brain (4; 61).

Integrated-brain. Relatively equal access to both sides of the brain and both styles of processing information; employs right- and left-hemispheres of the brain interchangeably as the situation demands; implies a balance of analytical and intuitive thinking skills (4).

Intuition. The word intuition stems from the Latin, intueri, which means "to look on" or "to look into" (139:135; 51:31). Intueri derives its legacy from the Greek concept of "nous," which is translated as the English word "intuition." It predates Plato and refers to a dynamic capacity which completely and immediately grasps universal truths (139:135).

Intuition is an indirect perception of the unconscious human mind that explores the known and unknown and senses possibilities and implications of reality which otherwise may not be readily apparent.

Lastly, intuition is personal and individualistic. It is a primary, untutored mental process which is in contrast to the conscious effort of learning (4; 144).

Left-brain. The left half of the front section (forebrain) of the human brain which, in most people, processes information analytically, logically, and rationally (4; 61).

Management Style. A method of decisionmaking and interpersonal interactions used on the job; in this research there are three management style options: right-brain; left-brain; or integrated-brain (4).

Management Type. A description of managers which includes brain style preference and potential intuitive ability (e.g., right-brain/intuitive)(4).

Manager. A leader or manager in an Air Force element with responsibilities such as command, administration, personnel, logistics, and/or service.

Potential Intuitive Ability. The underlying ability or preference to base decisions on intuition (4).

Potential Thinking Ability. The underlying ability or preference to base decisions on known facts and information (4).

Right-brain. The right half of the front section (forebrain) of the human brain which, in most people, processes information intuitively, holistically, and imagistically.

Furthermore, the right-brain is that portion of the human brain that controls emotions and creative, nonlinear, visual, spatial, and relational processes (4; 61).

Summary

This chapter has introduced the research problem/purpose. It covered germane topics ranging from a

statement of the reserach hypothesis and research questions to an examination of the research's scope and limitations, among others.

The following chapter will examine the literature associated with the subject of intuition, detailing intuition's mulitfaceted aspects.

II. A Review of Applicable Literature

Introduction

This chapter discusses the historical and current literature on intuition. It begins with an historical perspective, explores Jung's theory of personality, and examines the most pertinent aspects of intuition, to include the findings of brain research as they relate to intuition. It concludes with an examination of intuition, decisionmaking, and the future.

A Historical Perspective

Introduction. The term "intuition" is used and understood in numerous ways within historical literature. Vaughan (144:3) and Hall (56) recognize it as the "natural and spontaneous capacity that every man has" (56:64), and say that it is more highly developed in some people than in others (56:64; 144:9). The word itself stems from the Latin, intueri, which means "to look on" or "to look into" (91:135). Vaughan further defined intueri as "looking, regarding, or knowing from within," which he termed "experiential and holistic" (144:49). Other common occurrences are "second sight; sixth sense; intelligence incapable of self-consciousness; hunch; premonition; and preapprehension" (91:138). Reasons for this variation may be due to a lack of clarity concerning the mental process

involved or simply the attributing of generally unclassified mental activity to the "mental seeing" category of intuition (24:ix). Bunge, for example, states that

> Intuition is the collection of odds and ends where we place all the intellectual mechanisms which we do not know how to analyze or even name with precision, or which we are not interested in analyzing or naming. (24:ix)

Humans are generally believed to be capable of at least the following mental activities: perceiving; remembering; comprehending; applying knowledge; analyzing; and synthesizing and evaluating (21:201). Some consider that, through simple awareness, intuition, as a kind of perception, provides data for these mental operations (127:699-720). Jung, for example, defined intuition as "irrational," which for him meant that it was a "perceiving function" which did not require reason (68:49). Others believe that in complex problems, intuition suggests hypotheses for solutions or sees the final synthesis which solves them (144:43). Still others use intuition in reference to the production of moral, intellectual, and aesthetic judgments (127:699-720).

Among the multiple historical theories, definitions, and usages concerning intuition, four motifs surface in the literature. They are:

1. Man has a power of intuition which is separate and distinct from other mental activity.

2. Intuition is the prime agent to perceive truth.

3. Intuition is mysterious and illusive.

4. There is a feeling of conviction which accompanies intuition.

Intuition, a Distinct Cognitive Process. Many writers conclude that man has a power of intuition which can be differentiated from other mental abilities (4; 12; 15; 16; 17; 18; 21; 24; 26; 33; 44; 51; 53; 69; 112; 124; 150, among others). In particular, it can be distinguished from reason. Reason is a purposeful mental process, whereas intuition is spontaneous and unpredictable (51:24,32; 148:33). Although rational, analytical, or deductive thought is considered anathetical to intuition, it is nevertheless considered compatible (68). In fact, intuition is considered the catalyst of insight upon which reason is dependent (116:12).

Salk went further and stressed the "binary nature" of the relationship of intuition and reason (128:79). He stated that intuition is innate, but can be developed and cultivated. For him, intuition needs to be in charge of a "respectful intellect" (128:79-80).

> If a respectful intellect becomes conscious of intuition and reflects upon what it observes, a self-correcting, self-modifying and self-improving process is established. (128:80)

In general, intuition is considered a cognitive phenomenon; an idea; a mental insight; an intellectual

vision. It is contrasted with "inchoate or amorphous mental occurrences" which are never fully grasped by human consciousness (24:17-37).

The writers discuss great variations in the affective and cognitive components of intuition. Intuition can be almost entirely intellectual in nature (150:18-19) or it may be the finale of a period of irrational activity accompanied by strong emotion (148:22).

Intuition is considered to be an active human process (21:162), albeit Jung says it is an involuntary act (68:49). It is often contrasted with revelation, which is typically defined as a "state of passive receptivity" (127:34-35).

Intuition may be concerned with any subject matter. It is seen as the first principle of mathematics and formal logic and is used to apprehend objects of sense, to show generalizations and conceptions from empirical data, and to yield creative synthesis (33:14; 60:79; 68:82; 113:437; 132:28). Moreover, intuition is considered a primal source for self-knowledge and awareness of others, the world, and the supernatural realm (89:68-69).

Since intuitive insights often occur during other mental activities, intuition has been referred to as a "searchlight of knowledge which illumines all quests for knowledge and truth" (89:71). Intuition, therefore, is seen in a second motif as a perceiver of truth.

Intuition, the Perceiver of Truth. In the ageless quest for knowledge, man has used intuition as an agent on his odyssey. The Greeks freely used the concept of "nous" as they strived to understand the world. Nous referred to a dynamic human capacity to grasp universal truths. Plato used nous to reveal "the ideal" or that which is deathless and eternal. He defined nous as intuition by saying,

> After long acquaintance and study of a subject, intuition [nous] like a blaze kindled by a flying spark, suddenly springs up in the soul and at once becomes self-sufficient. (113:135)

Aristotle focused nous on nature rather than on the "ideal." Rejecting the notion that the order of nature is mathematical, he failed to follow the Platonic tradition which has always had a strong drive toward the unification of all knowledge into a single consistent system. Writes Randall,

> For Aristotle, knowledge comes from observing the world and reflecting upon what can be observed, not, as the Platonists held, from an immediate inner "intuition" or intellectual vision of a supposed intelligible realm. (112:95)

Nonetheless, Aristotle considered that intuition works with the data of experience to yield universal truths or principles (112:90-91).

Descartes, Kant, and others claimed intuition as the agent behind reason in the discovery of knowledge (17:63-64). Descartes searched for a method which could be used for discovery in philosophy and the sciences,

particularly mathematics and physics. He began his consideration with a study of the human mind and concluded that the mind arrives at knowledge in two ways: by intuition and deduction. Defining intuition, he said,

> By intuition, I understand, not the fluctuating testimony of the senses, not the misleading judgment that proceeds from the blundering constructions of imagination, but the conception which an unclouded and attentive mind gives us so readily and distinctly that we are wholly freed from doubt about that which we understand. (42:46)

Kant enriched the intuitive tradition by suggesting two intuitions (pure and empirical) and begins his Critique of Pure Reason by discussing intuition under the heading of "The Transcendental Aesthetic." His first sentence reads,

> Whatever the process and the means may be by which knowledge reaches its objects, there is one that reaches them directly and forms the ultimate material of all thought, intuition. (113:37)

He continues,

> Objects therefore are given to us through our sensibility. Sensibility alone supplies us with intuitions. These intuitions become thought through the understanding and hence arise conceptions. All thought therefore must, directly or indirectly, go back to intuitions, i.e., to our sensibilities, because in no other way can objects be given to us. (113:37)

Spinoza looked at intuition quite differently from Descartes and Kant, but still considered intuition to reveal truth about a world which is logically ordered and can be mathematically described. His vision of knowledge is of a "deductive system of implications, in which each idea is bound up with others in a logical order following from

initial axioms" (113:437). For intuition to have primary importance, it needed to follow the full use of reason, and then it would provide a superior perception of truth (144:49). In Tractatus, Spinoza speaks of intuitive knowing and concludes that one can intuitively know without the process of mental deliberation. However, he states that he himself has had limited success in exhibiting intuition.

> A thing may be perceived solely through its essence; when, from the fact of knowing something, I know what it is to know that thing, or when, from knowing the essence of the mind, I know that it is united to the body. By the same kind of knowledge we know that two and three make five, or that two lines each parallel to a third, are parallel to one another, etc. The things which I have been able to know by this kind of knowledge are as yet very few. (149:8)

Irrationalists cited intuition as a link with the affective domain, whereas religious thinkers argued for centuries that intuition helps one understand divine realities (89:68-69; 65:53-76). Currently many educators extol intuition as an integral element in the creative thinking of pupils (130:72). But a consensus remains that it is indeed mysterious and illusive.

Intuition, a Mysterious and Illusive Quality. A third motif in the literature is that intuition is an inexplicable or mysterious phenomenon. As a cognitive process, intuition contains obscure components. Intuition is ultimately recognized when it crystalizes as an idea, but prior to its realization, it is seen as coming from unknown mental regions and is attributed to virtually everything from a

diety to primate regression. Nonetheless, there exists a virtual consensus that man has a power of intuition. For some, God gave man an intuitive capacity that can be developed or allowed to lie dormant (65). For others, God has nothing to do with it, but it exists as much a part of nature as the normal senses of sight and smell. Writes Goldstern:

> In a world where birds migrate in ways incomprehensible to man, where fish "home" by a fantastically delicate analysis of the smell of a particular body of water, where the intelligence of man has achieved so much and endangered so much more, it seems wise to accept intuition as a power of man which has not been, and perhaps cannot be, exhaustively explored. (53:118)

Rationalists cannot express how they intuitively learned to see first principles; their best answer is, "I just know" (127:71).

Empirical philosophers typically feature intuition in their theories as hypothesis and see intuition as a cognitive synthesis of experience, culture, training, knowledge, perceptions, sensing, and accumulation of unconscious awareness occurring in one's subconscious, an understanding ascribed to by a growing number of psychologists and philosophers alike (24:85; 148:28). The element of "experience" is particularly discussed in the literature. Jones in his evaluation of executive decisionmaking states,

> The mind produces answers that grow out of the totality of all the impressions that have lain in the creator's [i.e., originator's] mind; some of these are his own experiences, but many are garnered from his readings and conversations.... The mind can, without apparent effort, organize, test, and weight [sic] a mass of specific information, much of which lies beneath the conscious level and little of which is subject to mathematical measurement. (67:51)

John Locke, George Berkeley, and David Hume stressed that all concepts are acquired through experience. They called this "concept empiricism" and "concept rationalism" (44:402). Terrence Sejnowski of Johns Hopkins University stresses that "humans get programmed by experience" (121:52), and Eliot in his studies on human development and cognition concludes that:

> No evidence has arisen to show that any concept that people have is innate...but when they do have a concept, it is derived in some way from experience.... (44:402)

Regardless of the actual source or character of intuition, those in the majority that extol intuition's validity also emphasize intuition's inherent conviction.

The Conviction of Intuition. The last main observation in the historical literature concerns the feeling of conviction which accompanies intuition. Philosophers hold diametrically opposed views on the reliability of intuition, though they invariably suggest that one feels more certain about the truth of intuitive knowledge than any other knowledge (24:112). Moreover, it was noted that a relationship exists between intuition and what one defines as knowledge. The more ambitious a definition of knowledge,

the more emphasis there is on the truth of intuition. For example, when philosophers seek absolute knowledge, they inevitably claim the intuitive method infallibly produces truth (24:178).

Other considerations relate definitions of knowledge to assumptions about intuition. If knowledge can be of things which cannot be empirically validated, such as knowledge of a divine reality, knowledge of one's psyche, or knowledge of a mental occurrence, then some truth criteria by which to compare and evaluate intuitions must be found. There is no consensus on such criteria (65:158). On the other hand, if knowledge is defined as that which can be objectively tested, verified, and shared, intuitions are simply a mediate form of mental activity. Intuitions present candidates for the status of valid knowledge or insight and must pass prescribed tests before being considered useful or true. Writes Eisely:

> While scientists must argue that intuition cannot infallibly present truth, they rely on the feeling of certainty which intuition provides. This feeling-dimension is often essential to continued efforts because scientists cannot prove hypotheses; they only succeed or fail in attempts to disapprove them. One grasps the truth of a theory by intellectual insight or intuition; this provides the confidence which bolsters efforts to evaluate the extensibility and efficacy of the theory for purposes of interpreting and predicting occurrences in the world of nature. (43:38)

Carl Jung

Introduction. Kaplan in his research into the history of accounting states that he is impressed by the importance that personality and intuition play in decisionmaking (70:416). Historically, Carl Jung is one of the earliest theorists to classify human personality in terms meaningful to behavior and decisionmaking (69). Additionally, he was also one of the earliest theorists to specifically relate the concept of a subconscious to intuition; in fact, he defines intuition as "that psychological function which transmit perceptions in an unconscious way" (69:567-568). His concepts are therefore useful in understanding the role of intuition in the decisionmaking process.

The Unconscious. In common with most of his contemporaries, Jung uses the unconscious to refer to what is currently known as the subconscious or the preconscious. For Jung the unconscious consists of

> ...everything of which I know, but of which I am not at the moment thinking; everything of which I was once conscious but have now forgotten; everything perceived by my senses, but not noted by my conscious mind; everything which, involuntarily and without paying attention to, I feel, think, remember, want and do; all the future things that are taking shape in me and will sometime come to consciousness: all this is the content of the unconscious. These contents are all more or less capable, so to speak, of consciousness, or were once conscious and may become conscious again the next moment. (78:55-56)

Jung's Theory of Personality. In his Psychological Types, Jung presents a dynamic theory of personality. Built

on Hippocrates' four basic types of personality (sanguine, choleric, melancholy, and phlegmatic) (82:34), Jung sees individuals having multiple modes of adjustment in a search for creative development and wholeness. "In human affairs, what appears impossible upon the way of the intellect has very often become true upon the way of the irrational" (69:113). Jung considers intuition to be irrational, but defines irrational to be "perceiving" as opposed to "reasoning" (68:82).

Jung sees the psyche, or total personality, composed of separate but interacting systems. These include the "ego" or "conscious mind," the "personal unconscious," where experiences which were once conscious have been repressed, forgotten or ignored, and the "collective unconscious," which is the storehouse of latent memory traces inherited from man's ancestral past which includes "philogenetic traces" extending back to animal ancestry (55:79-80). Individual personalities become established through the development of relationships among these components.

Attitudes. Jung sees two fundamental attitudes common to humans: extraversion and introversion. Extraversion leads the individual to react to the external, objective world, whereas introversion leads to the inner, subjective world. He holds that one of the attitudes becomes characteristic of an individual.

Functions. In addition to the basic attitudes, he assumes four functions: thinking, feeling, sensing, and intuition. Generally, one of the four functions is predominant in an individual and is considered to be the superior function. Thinking and feeling are considered to be rational functions since they are dependent on reason, judgment, abstraction and generalization, whereas sensing and intuition are considered irrational.

The Intuitive Personality. Jung uses the more common contrast between intuition and reason, but adds further details as he sketches in his personality types. He describes intuitive personalities by saying

> ...the intuitive rouses unconscious perception to the level of a differentiated function, by which he also becomes adapted to the world. He adapts himself by means of unconscious indications, which he receives through an especially fine and sharpened perception and interpretation of faintly conscious stimuli. How such a function appears is naturally hard to describe on account of its irrational, and so to speak, unconscious character. In a sense, one might compare it with the daemon of Socrates with this qualification, however, that the strongly rationalistic attitude of Socrates repressed the intuitive function to the fullest extent; it has then to become effective in concrete hallucination, since, it had no direct psychological access.... But with the intuitive type, this latter is precisely the case. (69:182)

To develop his theory that individuals exhibit one of two basic attitudes while they habitually function predominately in one of four modes, Jung distinguished extraverted from introverted intuitive types. The extraverted intuitive receives perceptions from his environment.

> Intuition as the function of unconscious perception is wholly directed upon outer objects in the extraverted attitude...intuition, which is by no means a mere perception, or awareness, but an active, creative process that builds into the object just as much as it takes. But, because this process extracts the perception unconsciously, it also produces an unconscious effect in the object. (69:182)

According to Jung, the primary function of intuition is to transmit generalities, images, or perceptions of relations and conditions. This form of intuition is satisfied in the extravert through the awareness of possibilities. Intuition tries "to apprehend the widest range of possibilities, since only through envisioning possibilities is intuition fully satisfied" (27:222).

> Intuition seeks to discover possibilities in the objective situation; hence as a mere tributary function...it is also the instrument which, in the presence of a hopelessly blocked situation, works automatically towards the issue, which no other function could discover. Where intuition has the priority, every ordinary situation in life seems like a closed room, which intuition has to open. (69:463)

Jung expounded further on the extraverted intuitive type by saying:

> The intuitive is never to be found among the generally recognized reality values, but he is always present where possibilities exist. He has a keen nose for things in the bud pregnant with future promise. He can never exist in stable, long-established conditions of generally acknowledged though limited value; because his eye is constantly ranging for new possibilities, stable conditions have an air of impending suffocation.... The morality of the intuitive is governed neither by intellect nor by feeling; he has his own characteristic morality, which consists in a loyalty to his intuitive view of things and a voluntary submission to its authority. Consideration for the welfare of his neighbors is weak.... Such a type is uncommonly important. If well-intentioned, with an

> orientation to life not purely egotistical, he may render exceptional service as the promoter, if not the initiator, or every kind of promising enterprise. He is the natural advocate of every minority that holds the seed of future promise.... His capacity to inspire his fellow-man with courage or to kindle enthusiasm for something new, is unrivaled, although he may have forsworn it by the morrow. (69:466)

This intuitive type seeks new challenges and feels confined by reality. Jung points out that he may not follow through on his plans and may squander his life: "Yet all too soon must he be running after some fresh possibility, quitting his newly planted field, while others reap the harvest. In the end, he goes empty away" (69:466).

The introverted attitude produces a different type of intuitive person. While, according to Jung, neither type intuitive is common in any given population (albeit, introverted intuitives appear to be more common in research, whereas extaverted intuitives appear to be more common in business (compare 4; 18; 100; 110; 124)), Jung seems to feel that the introverted type is rarer:

> The introvert interposes a subject [sic] view between the perception of the object and his own action, which prevents the action from assuming a character that corresponds with the objective situation. (69:471)

> The unconscious images attain to the dignity of things or objects.... The images appear as though detached from the subject, as though existing in themselves without relation to the person.... The consciousness of his own bodily existence fades from the introverted intuitive's view, as does its effect upon others. The extraverted standpoint would say of him: "Reality had no existence for him; he gives himself up to fruitless phantasies." A perception of the unconscious images, produced in such inexhaustible abundance by the creative energy of life, is of course fruitless from the standpoint of immediate utility. (69:506)

Jung suggests that this type of personality produces a peculiar type of person, the mystical dreamer and seer or the fantastical crank and artist (69:508). However, he also says, "Had this type not existed, there would have been no prophet in Israel" (69:507). The introverted intuitives' main activity is directed within, so that their exteriors portray reserve, secretiveness, lack of sympathy, and an apparently groundless perplexity. This contributes to a general public lack of rapport with them, but Jung feels that:

> We shall form a fairer judgment of such men and grant them a greater indulgence, when we begin to realize how hard it is to translate into intelligible language what is perceived within. (69:511-512)

Jung's point is simply that language is inadequate to express the richness, vitality, and dynamic quality of the introverted intuitives' conceptualizations and perceptions.

Remembering that intuition is that function which transmits perceptions in an unconscious way, one finds that extraverted intuitives are receiving perceptions subconsciously from the external world while introverted types are receiving them second hand, as it were, from their own subjective consciousness. Jung points to a radical difference between these types in the psychic assimilation of a perceived image. The extraverted type refers preeminently to what reaches him from the object, while the introvert principally relies upon that which the outer impression build within him (69:412).

Jung's personality typing became more pragmatic and applicable when it was incorporated in the early 1960's into a tool useful for personality type identification. That tool, the Myers-Briggs Type Indicator (MBTI), has become useful in identifying intuitive personality types and therefore is of value to this research in qualifying the role of intuition in the decisionmaking process.

Myers-Briggs Type Indicator (MBTI)

Introduction. The MBTI was developed by Isabel Myers and Katharine Briggs as a psychological instrument to measure personality preferences (62:3). Myers stated that the purpose of the MBTI was to implement Jung's theory of personality type (101) and to make his theories more understandable and useful to people (102:1). Since the MBTI was designed to implement Jung's personality theories, those theories must be understood for the MBTI to make much sense (102:1).

Jungian Typology. The basis of Jung's previously discussed theory was the belief "that much seemingly random variation in human behavior is actually quite orderly and consistent, being due to certain basic differences in the way people prefer to use perception and judgment" (102:1).

> Perception is understood to include the processes of coming to conclusions about what has been perceived. If people differ systematically in what they perceive and the subsequent conclusions, they may as a result show corresponding differences in their reactions, in their interests, values, needs and motivations, in what

> they do best and in what they like best to do. Adopting this working hypothesis, the indicator aims to ascertain, from self-report of easily reported reactions, people's basic preferences in regard to perception and judgment, so that the effects of the references and their combinations may be established by research and put to practical use. (101:1)

Myers and Briggs incorporated Jung's two attitudes (extraversion and introversion) and his four explicitly stated mental orienting functions (sensing, intuition, thinking, and feeling), which depict an individual's consciousness, in their MBTI (102:12-13). They also made explicit the elements of judgment and perception, which were implicit in Jung's work (102:13). The resulting MBTI contains separate indices for determining each of four bi-polar scales, as indicated in Table 1; the first letter of each element is used for indices identification (62). Some characteristics of each of the four styles are indicated in Table 2 (62:4). The four bi-polar scales themselves result in sixteen individual psychological types as indicated in the type table at Table 3 (62:11).

Table 1. MBTI Bi-polar Indices (62)

Index	Scales
EI	Extraversion or Introversion
SN	Sensing or Intuition
TF	Thinking or Feeling
JP	Judgment or Perception

In terms of Jung's theories, as incorporated in the MBTI, one may reasonably be expected to develop most skills with the processes he prefers to use in the areas where he prefers to use them. If he prefers "E," he should be more comfortable and effective in dealing with the expectations of the environment (i.e., outer world of activity) than with ideas (i.e., inner world of thought and contemplation). If he prefers "S," he should be more effective in perceiving

Table 2. Characteristics of Each of the Four MBTI Scales (62:4)

Extraversion	Introversion
Preference for drawing energy from the outside world of people, activities, or things	Preference for drawing energy from one's internal world of ideas, emotions, or impressions
Sensing	Intuition
Preference for taking in information through the five senses and noticing what is actual	Preference for taking in information through a "sixth sense" and noticing what might be
Thinking	Feeling
Preference for organizing and structuring information to decide in a logical, objective way	Preference for organizing and structuring information to decide in a personal, value-oriented way
Judgment	Perception
Preference for living a planned and organized life	Preference for living a spontaneous and flexible life

facts than possibilities. If he prefers "T," he should be more comfortable in his thinking judgments (i.e, objectivity) than in his feeling judgments (i.e., subjectivity). If he prefers "J," he should be more skilled at ordering his environment than in adapting to it (101:1-2).

Table 3. MBTI Type Table (62:11)

	S	S	N	N	
I	ISTJ	ISFJ	INFJ	INTJ	J
I	ISTP	ISFP	INFP	INTP	P
E	ESTP	ESFP	ENFP	ENTP	P
E	ESTJ	ESFJ	ENFJ	ENTJ	J
	T	F	F	T	

Value of the MBTI. The MBTI has been used extensively since its inception in the early 1960's to characterize personality types. Agor (4; 8:52), Leigh (82:36), Huber (63:572), and McKenny and Keen (95:83) all emphasize that their research clearly supports the concept that specific personality types (cognitive styles) are particularly well-suited for certain roles and tasks. If their contentions are correct, the proper identification of intuitively-based personality types is of importance to the Air Force as decisions are made on officer personnel

assignment placements. Further importance of the MBTI and its capability to assist in personality type identification will be shown in Chapter III.

Both Myers (13) and Jung (27; 68) expounded on the effect of intuition on creativity and their corporate role on decisionmaking. For Jung, without intuition, one cannot envision the possibilities (27:222) nor can one truly perceive (68:49) or imagine the imaginable (68:82).

Intuition and Creativity

Introduction. Goldberg states that intuition manifests itself as one of six functional types: discovery; evaluation; operation; prediction; illumination; and creativity (51:45-61). The last, creativity, is the most often explored aspect of intuition and the one most applicable to decisionmaking (51).

> Creativity is the quintessence of man; and the spark of inspiration, the insight, the intuitive understanding on which our creativity depends is fundamental to both the fulfillment of the individual and the progress of humanity. (18:xxiii)

Carl Jung's coupling of intuition and a less-than-conscious mind opened the door to exploration of the creative process, and the concept of creativity is of vital importance to progress. Burt says:

> If there is such a thing as creativity...then it is clear that civilization must owe much, if not everything, to the individuals so gifted. The greater the number and variety of genuinely creative minds a nation can produce and cultivate, the faster will be its rate of progress. (75:7)

Stages of Creative Thought. E. Paul Torrance outlines the stages in creative thought which can lead to progress:

> The steps in the creative process seem to be quite well established and the process appears to be essentially the same regardless of the activity.... First, there is apparently the sending of a need or deficiency, random exploration, and a clarification or "pinning down" of the problem. Then ensues a period of preparation accompanied by reading, discussing, exploring, formulating many possible solutions, and critically analyzing these solutions for advantages and disadvantages. Out of all this activity comes the burst of a new idea--flash of insight, illumination. Finally, there is experimentation to evaluate the most promising solution and the selection and perfection of the idea. (108:40)

The period preceding the flash of inspiration is often referred to as the intuitive period, and it is intuition which is presumed to reveal the idea which is the creative product (51:48-50; 108:41; 120:416), a blending of old and new.

A Synthesis of Old and New. John Dewey is simple in his use of the term intuition, believing it to be the most ambiguous in the whole range of thought (39:266). He suggests that intuition is based on obscure biological data, but does not postulate a subconscious, as did Jung. Ambiguous or not, he saw it as an integral element of creativity and one in which the old and new meet:

> Intuition is that meeting of the old and new in which the readjustment involved in every form of consciousness is effected suddenly by means of a quick and unexpected harmony which in its bright abruptness is like a flash of revelation; although in fact it is prepared for by long and slow incubation. Oftentimes the union of old and new, of foreground and background, is accomplished only by effort, prolonged perhaps to

> the point of pains. In any case, the background of organized meanings can alone convert the new situation from the obscure into the clear and luminous. When old and new jump together, like sparks when the poles are adjusted, there is intuition. This latter is thus neither an act of pure intellect in apprehending rational truth nor a Crocean grasp by spirit of its own images and states. (39:266)

Most of the theorists that treat creative intuition similarly suggest that a synthesis takes place in which the old and new ideas blend to form original and novel patterns. Dewey's position differs from most of the others because he does not assume a subconscious functioning concurrently with the conscious mental process.

Subconscious/Preconscious Aspect. Poincare became a pioneer in the investigation of the creative process because he sought to understand the source of his own mathematical giftedness. Disagreeing with Dewey, he concurs in Jung's notion that the subconscious works steadily to solve problems. His theory stresses the importance of an unconscious stratum of thought (22:38).

Seidel states that the subconscious selects data and somehow grows as the conscious mind:

> Creativity of any sort is not a sudden affair. The solution to a particular problem, whether it be scientific or artistic, may appear quite suddenly and without immediately apparent causes. However, from what we have seen of the analysis of the role of forgetting and association of ideas in the unconscious, the apparent sudden flashes of immediate insight are not as sudden and unprepared as they my actually appear to conscious awareness. The birth of a new idea in consciousness, not unlike the birth of a new offspring, requires a period of gestation.... The creative person is alive, and the process operating within him is alive

> and well.... The assimilative association of new ideas through new experiences continually builds up the interconnected and interconnecting accumulation, which is the unconscious. (132:112-113)

Kubie places major emphasis on the creative role of preconscious processes. He examines the composition of the preconscious and finds one component to be phenomena which have been learned consciously but have since dropped out of the focus of conscious awareness. Examples of these are breathing, moving and crying. He says that once any such act is fully learned, it can be initiated quite independently of inner physical prodding merely by contemplating the goal.

> It is in this way that our thinking processes acquire the ability to leap over many intervening steps as we perform complex arithmetical processes. Moreover, this is the root of intuitive thinking, whether in science or the arts. (76:33)

Multi-spheres of Consciousness. Koestler goes beyond Poincaré, Seidel, and Kubie and presents a theory about what he believes happens in creative thought. He suggests that all creative activities have a basic pattern in common. He argues that people develop matrices of thought, a matrix being "any ability, habit, or skill, any pattern of ordered behavior governed by a code of fixed rules" (75:38). Koestler holds that the creative progress occurs when one perceives a situation or idea in two habitually incompatible frames of reference (75:35). He argues that the creative act always operates on more than one plane of thought,

connecting previously unrelated dimensions of experience. By contrast, associative thought operates among members of a single pre-existing matrix (75:656). Koestler insists that the creative act involves several levels of consciousness (75:659) and unequivocally relates intuition to creativity.

Koestler has examined a wealth of literature in which individuals describe the steps by which they arrive at creating or being creative, and states that the "evidence indicates that verbal thinking, and conscious thinking in general, plays only a subordinate part in the decisive phase of the creative act (75:211). He found many references to intuition:

> ...their virtually unanimous emphasis on spontaneous intuitions, unconscious guidance, and sudden leaps or imagination which they are at a loss to explain, suggest that the role of strictly rational thought processes in scientific discovery has been vastly over-estimated since the Age of Enlightenment; and that, contrast to the Cartesian bias in our belief, "full consciousness," in the words of Einstein "is a limit [sic] case." (75:208)

He sums up much of his work on the subject when he says:

> The moment of truth, the sudden emergence of a new insight, is an act of intuition. Such intuitions give the appearance of miraculous flashes, or short-circuits of reasoning. In fact they may be likened to an immersed chain, of which only the beginning and the end are visible above the surface of consciousness. The diver vanishes at one end of the chain and comes up at the other end, guided by invisible links. (75:211)

The Transliminal Mind. Rugg presents a theory which sums the thought on intuition and the creative process. For

him, life presented a puzzling question; that is: "What is the nature of the act of thought when, in one brilliant moment, there is a sudden veering of attention, a consequent grasp of new dimensions, and a new idea is born" (125:xi). He studied philosophy, reports from hypnotists, from surgeons engaged in cerebral cortex research, from psychologists experimenting with drugs, as well as research from the disciplines of education and sociology. His aim was to bring together two primary sources of knowledge. The first is intuitive wisdom; the other is the conceptual consensus and the tested theories of the behavioral sciences (125:1). He concludes that intuition is a way of knowing things which scientific methods cannot come to grips with. Speaking of criteria for an adequate theory of creative imagination, he says:

> The theory must postulate that there are two ways of knowing: an intuitive, inside way of identification with the object or person, and an outside scientific, observational and measuring approach. (125:241)

Further, he speaks of knowing in behavioral terms:

> In men the special function of the central nervous system is the perception of form or Gestalt, and when it occurs in the flash of insight, it is the forming of the imagined conception. This is the intuitive, inside way of knowing through identification with the object. (125:116)

> Lorenz, founder of scientific ethology, agrees that Gestalt perception is identical with that mysterious function which is generally called 'Intuition,' and which indubitably is one of the most important cognitive faculties of Man. (125:292)

Rugg also speaks of the "intuitive mind of creative imagination" (125:186), and hypothesizes that creative intuition is "Galileo's il lume naturale, Newton's leap of the imagination, and Gauss' 'sudden lightning flash'" (125:170). He calls it the autonomous forming process of the unconscious, "which takes place at the critical threshold of the conscious-nonconscious continuum," which he calls the "transliminal mind" (125:40). Thus, in using intuition, Rugg refers to it as creative illumination, quick inference, and a special kind of knowing which identifies with the object and presents personal knowledge of it which scientific analysis cannot yield.

Dynamic Intuition. Theorists who propose a subconscious, preconscious, or other level of the unconscious which figures in creative activity, and most of them do, usually postulate an active intuition which creates and reveals a synthesis, a putting together of elements and parts to form a pattern or structure which is new (21:162). This synthesis is a natural outcome of preliminary, conscious effort by the individual. For Webber, "creativity is rarely a single flash of intuition"; he sees it as a process that requires "extensive analysis of a great many observations to separate the significant from the irrelevant" (146:655). Ruggiero agrees. He sees creative insight requiring effort, even though it may arrive during the leisure that follows intense activity. For him the

conscious mind "turns the problem over to the unconscious, which continues working and provides the insight" (126:122).

Finally, Jung saw imagination and intuition as complementary aspects of creativity and elements vital to our understanding. Even though popular opinion, according to Jung, regarded them as primarily valuable only to poets and artists and of little value in "sensible matters," Jung nevertheless considered them to be value for all matters, including the "higher grades of science" (68:82).

Creativity, a Learnable Art. De Bono, in his developmental process of teaching creativity, saw the mind as a patternmaking system that "acts to create patterns and recognize them" (33:27). For him, the most important property of the mind was its ability to create its own patterns (33:28). But the mind, according to de Bono, does not actively sort out information.

> The information sorts itself out and organizes itself into patterns. The mind is passive. The mind only provides an opportunity for the information to behave in this way. (33:28)

De Bono defined two types of thinking: vertical and lateral (33:12). He characterized vertical thinking as that which is analytical and logical in human thinking, and lateral thinking as the seat of creativity, insight, and source of new ideas (33:11-14). Later, Hampden-Turner identified de Bono's lateral thinking as the intuitive aspect of the human cognitive process (59:86-88). For

de Bono, both vertical and lateral thinking are required and neither is a substitute for the other. However,

> The exclusive emphasis on vertical thinking in the past makes it all the more necessary to teach lateral thinking. It is not just that vertical thinking alone is insufficient for progress, but that by itself, it can be dangerous. (33:13)

In the final analysis, de Bono believes lateral thinking can be learned (33:13), and therefore creativity can be learned (33:13). Agor (4), Vaughan (144), Goldberg (51), Rowan (124), among others, support de Bono in this contention.

De Bono's vertical/lateral thinking model was in actuality a cognitive modeling of the precepts of brain science and the results of brain research (59:86-88). It is brain research which has most recently helped in an understanding of human cognitive processes and has been especially beneficial in properly conceptualizing intuitive mental functions and their effect on decisionmaking.

Right-brain/Left-brain Research

Introduction. During the past forty years, research on the human brain has emphasized the differences in the two halves of the cerebral cortex. The left forebrain has been identified as the seat of rational, logical, and analytical thinking, and the right forebrain has been identified as the location of intuitive, holistic, and imagistic thought. The findings of brain research are therefore germane to the study of intuition and decisionmaking.

A Historical Perspective. Historically, the first association of brain locus functional correspondence was made by Hippocrates who noticed the relationship between lateral head injury and corresponding damage of the opposite side of the body (153). Much later, in 1861 in France, Paul Broca had the first major breakthrough in understanding brain hemispherics. Broca discovered, and could replicate at will, that damage to the left aft frontal lobe caused aphasis, a speech disorder, whereas similar damage to the right forebrain did not result in aphasis (150).

Other than general interest in the findings, little was done on the subject until the middle of the Twentieth Century. It was Roger Sperry's Nobel Prize winning research with split-brain patients that brought international attention to brain hemisphere research (103).

Brain Physiology. The human brain itself is divided into three or four main parts, depending on which categorization method one uses, with three divisions being most common. MacLean, of the National Institute of Mental Health, is a main proponent of three divisions. He postulates a triune brain theory with a hierarchy of three brain types, each with its own chemistry and structure. They are the "outer brain" (includes the cerebral cortex with right and left hemispheres--the areas of interest for this research); the "middle brain" (includes the limbic system--the seat of human emotion); and the "inner brain"

(the locus of human primitive processes). According to MacLean, these three elements of the human brain are interconnected and each has its own intelligence, subjectivity, sense of time and space, and memory and related functions (89). The outer brain was the last to evolve and subdivide into right and left hemispheres. Later Cade and Coxhead agreed with MacLean, but used slightly different names: the "higher cortex"; the "limbic system"; and the "brain stem" respectively (26).

Though the brain sections were once believed to be anatomically identical, they are now known to be asymmetrical (50). Sperry (136) was able to demonstrate brain hemispherics with his experiments with split-brain patients. Several patients who suffered from epileptic seizures had their corpus callosum surgically severed. The corpus callosum is the larger connector between the right and left halves of the brain. The severance isolated the two hemispheres. After isolation, Sperry found that the two hemispheres were not able to intercommunicate, and that the patients now had two separate spheres of consciousness, each sphere with skills unavailable to the other. Of note is Hampden-Turner's observation:

> Neither other primates nor human infants are specialized. Indeed a small infant can lose an entire hemisphere and grow up normally--an extraordinary testimony to the organism's integrative capacities--but increasingly serious impairment results from losing either hemisphere after the age of about two or three. Most investigators have attributed hemispheric specialization to human language acquisition. (59:88)

Geschwind also found that each side of the brain is anatomically interested in the opposite side of the body. For example, even though the ears are interfaced with the auditory cortex of both sides of the brain, the interface to the opposite side is much stronger. The eyes are even more complex. Images from the right side of each eye are projected onto the left visual cortex; the left visual field from both eyes registers in the right hemisphere (50). Hampden-Turner gives an excellent example of this phenomenon:

> If a patient who has undergone the split-brain operation is given a pencil to hold in his right hand, where he cannot see it, he can immediately describe it as a pencil, since the right hand connects to the verbal left hemisphere. But if the pencil is placed in the left hand, the silent right hemisphere, unable to instruct the left, cannot describe the pencil. It is possible, using a tachistoscope, to beam messages exclusively to those parts of the left or right eye which are cross-connected to the right and left hemispheres. Thus the word HEART was flashed in such a way that HE was exposed to the right hemisphere and ART to the left. When asked to verbalize what they had seen, patients replied 'ART,' but when asked to point with the left hand to a chart with several words, they pointed to 'HE.' (59:86)

Hampden-Turner explains that the reason for the use of the tachistoscope (a device that limits visual space and time) in the "HEART" experiment is that the eyes will scan the whole word, given more than a second (59:86).

More recent experimentation involved the use of electroencephalogram (EEG) pattern analysis. Subjects involved in mental arithmetic, analytical tasks, or verbal

tasks exhibited markedly greater brain activity in the left hemisphere and those involved in spatial, imagistic, or nonverbal tasks showed much greater brain activity in the right hemisphere (136).

Of recent note, Alan Gevins, at EEG Systems Laboratories in San Francisco, has shown that electroencephalograms which can in fact record and monitor electrical signals and activity in the brain hemispheres, cannot monitor the larger patterns of signals that characterize "real thought" (121:53).

The question of "real thought," as the essence of the mind as apposed to the brain, is a subject that is currently under research at Washington School of Medicine in St. Louis (99). Steven Peterson and Peter Fox have advanced the positron emission tomography (PET) technology, developed in the early 1970's. The technique uses radioactive labeled substances, such as glucose or blood, and traces blood flcw in a designated orgin (99:58). Their experiments with cognitive functions have substantiated the findings of brain hemispherics to date (99:61).

Brain Hemispherics. As a result of these and other experiments, most scientific researchers agree that the left hemisphere has a superiority for logical, rational, analytical, systematic, discriminatory, sequencial, verbal, and linear thinking processes (23; 120; 139), and the right hemisphere (in most people) controls emotional, holistic,

intuitive, creative, nonlinear, visual, spatial, and relational thinking processes and has a superiority for music melodies and facial recognition (4; 12; 61; 96; 98; 102; 120; 121). Katz and Kahn, Davis and Olson, Mintzberg, Agor, Vaughan, and others agree that people who are able to use either hemisphere effectively (i.e., an integrated-brain) are more creative, innovative, and are better able to solve complex problems (4; 31; 71; 98; 144). It therefore follows that

> Damage to parts of the left hemisphere impedes speech, language, verbal memory, mathematics, and the sense of time; it also tends to be specific to certain organs and functions. Damage to right hemisphere impedes performance in understanding visual and tactile mazes, perception of depth and movement, visuo-spacial organization, and tends to produce diffuse and general patterns of disturbance. (59:86)

Further Research Needed. Brain research has a long way to go before it will have adequately answered the many questions raised (5:17; 51:224-226; 139). Although there has been a great deal of research in the past twenty five years, there have been conflicting results and major disagreements on experimental results. Questions such as which brain wave activity to measure (alpha--lower frequency; beta--higher frequency); placement of electrodes; and the lack of use of behavioral data are but a few examples. Perhaps Peterson's and Fox's PET technology will help address these questions (99).

Brain Dominance by Demographics

Introduction. Research has shown that the following demographic categories are significant in the study of intuition and decisionmaking: occupational specialties; levels of management; gender; and ethnic background. This aspect of the literature review is an examination of each of those categories as they relate to brain hemisphere preference (i.e., left-brain; right-brain; and integrated-brain).

Occupational Specialties. In his study of Harvard University graduates, Livingston (85:79-89) found that professional advancement of MBA (Master of Business Administration) degree holders stopped at the middle management stage after approximately fifteen years . The majority of Harvard graduates had staff positions where they worked as specialists on analysis and research projects, similar to the ones they completed during their academic education. It was these positions, however, which failed to lead to top management. Livingston concluded that Harvard MBA's remained in staff positions because they were more comfortable using their well-developed analytical (left-brain) skills than in learning the more intuitive, imprecise, emotional, and experiential (right-brain) skills necessary to manage people effectively.

Mintzberg in his study (98:49-58) singled out planners, instead of MBA's, as individuals who were more structured

and linear than managers in general in their view of the world. He believed it was a function of the planner to apply regular, continuous, and systematic processes to planning. People who liked working as planners, Mintzberg suggested, not only would be dissatisfied as managers, but they also would likely be unsuccessful in that more diversified role. Good managers should have "intuitive and experiential" abilities to cope with the "irregular inputs of the environment," according to Mintzberg (98:11). Mintzberg noted that the role of the manager was to think about the future, to synthesize, make objections, offer alternatives, and point out inconsistencies. Good planners were left-brained, but good managers were both left- and right-brained (98:8-11).

In a comparison study of chief executive officers and school superintendents, Coulson and Strickland (29:163-174) found that top executives had more right-brain preferences for problem solving than school superintendents. The balance of right-brain and left-brain thinking necessary for creative problem solving and implementation, which was consistently present in business executives, was less prevalent in the superintendents tested. School superintendents in the study preferred logical, analytical, and linear approaches to problem solving and decisionmaking. Coulson and Strickland argued that in times of rapid change and uncertainty, rational and linear

(left-brain) strategies would not provide creative solutions to problems in education. Although there were understandable reasons for the differences between business executives and superintendents, the study concluded that superintendents must learn right-brain, intuitive skills, if they were to provide the innovative solutions necessary for school systems in the next century.

Herrman surveyed over 6000 individuals with his "Brain Dominance Profile" (61:11-16). "People gravitate toward work that fits their brain style preference," according to Herrman (61:16), so there would naturally be similarities among accountants versus English teachers versus entrepreneurs. Herrman characterized middle managers as those who emphasized structure and control; that is, more left-brain skills. Social workers and psychotherapists were more emotional, interpersonal, and spiritual; that is, more right-brained. Ironson (64:18-21) agreed that most occupational groups had dominance patterns that were similar. That conclusion should not be surprising since similar skills were necessary for similar professions, in Ironson's opinion (64:20).

As a result of his study on 2,000 public administrators, Agor (4; 8) concluded that individuals working in planning, management science, financial management, law enforcement, and the military were more likely to have left-brain management styles. Integrative

styles were more prevalent for top policy management, general administration, and intelligence occupations. A right-brain management style was more likely for personnel, counseling, health care, public affairs, public relations, advertising, marketing, crisis management, and organizational development occupations.

Myers (100) found similar results with her Myers-Briggs Type Indicator (MBTI). She reported that accountants and bank employees were more left-brained while salespersons, customer relations officers, and creative writers were more right-brained and intuitive. Evidence from students in various majors showed similar results. Students in finance were more analytical, while students in counseling and health-related fields were more intuitive, as with Agor's study of those occupations.

Similar findings were reported by Sperling (135:2B) in his report of Daniel J. Isenberg's study of senior executives which showed that intuition was critical, not only in solving a problem, but in sensing that a problem existed in the first place. The two brain modes were used together (that is, integrated), but it was clear that executives did not logically rationalize every decision before it was made, or before they acted. They were able to deal with ambiguity, learn from surprises, and address problems holistically, rather than in isolation, taking into account the way each problem and proposed solution would

affect the rest of the organization. These special skills are right-brain, intuitive abilities (135:2B).

Of interest to the subject of occupational choice are the findings of Girdano and Everly in their stress/tension studies. They found that

> Worker's health is closely linked to whether their brain skills are properly matched to their jobs; whether they are in touch with their dominant brain styles; and whether they are in fact using their dominant brain styles on the job. (8:52)

Management Level. Piatt (111:64-69) believed that top administrative positions were best filled with people exercising integrated management styles because of the varied nature of the responsibilities. It was, however, more likely for a comptroller to have a left-brain style and for a sales managers to be right-brained because of the nature of their work. Although it might seem that the best of all worlds would be to have all personnel with integrated styles, Piatt suggested that most organizations should have all three styles to be most effective and productive. By not understanding the differences required of different levels of management, a teacher who was right-brain dominant might be promoted to an administrative position which required predominantly left-brain tasks. Chances are the teacher not only would find the job distasteful, but it is also likely that his or her efficiency would be greatly reduced, causing the organization to suffer (111:64-69).

Agor's study indicated that top managers have more integrated management styles than do middle and lower level managers (4:28-36). His survey also showed that top managers have higher potential intuitive abilities than do middle and lower managers. It was not evident from his research whether managers become top executives because they are more intuitive and integrated or become more intuitive and integrated as they advance up the corporate ladder.

Other researchers showed similar results. Miller in his limited study of sixteen chief executive officers found that while many executives rely heavily on logical and analytical decisionmaking processes, just as many, if not more, executives use no formal, decision science methodology but rather rely on their intuition (97:41-44). Additionally, a study conducted at Newark College of Engineering indicated that intuitive chief executive officers consistently outperformed peers and competitors in future market predictions (52:44).

Herrman's work showed that top managers were more likely to have balanced brain style preferences, whereas middle managers preferred a more analytical, left-brain style (61:11-16). Earlier, Dean (32) had reported higher intuitive levels for chief executive officers, particularly successful executives, than for other management levels.

Gender. Agor's survey results indicated a clear superiority for women in the intuitive section of his questionnaire for every group sampled (4:16-30). In addition, women's overall management style was higher in the integrative scale than men's. Female managers at all levels were more similar in management style to top managers than most men. To Agor, this suggested that there were women in various levels of management who had the potential for top management responsibilities. This pattern was maintained even when management level was controlled.

Similar results were suggested by other researchers. Research was conducted at the Cranfield School of Management in 1986. It dealt with twenty five female managers from the MBA program, forty two members of the National Organization of Women in Management Education, and twenty female middle managers from British Telecom. Of the women tested, seventy five percent tended to be intuitive and forty percent showed a strong visionary (intuitive leadership) profile (145:13-21).

Alice Sargent in her book, The Androgynous Manager, also affirmed those research findings. Sargent noted that women historically had to develop intuitive abilities more than men because they have been in positions of less power. In order to survive and to accrue power, women had to practice and increase their intuitive abilities, since more

direct methods did not succeed. While men learned to suppress feelings and to de-emphasize inductive mental processes, women were encouraged by Western culture to develop them, according to Sargent (129:27-52) and Vaughan (144:69-70). It is just those inductive mental processes that Lamkin states are the natural strengths for women in leadership. For Lamkin, those strengths are characterized by a natural ability, in general, in the areas of interpersonal relations, intuition, and conflict management (77:151-154).

Other studies, such as one by Restak, have discovered differences in the brains of female and male infants which might help to account for women's greater intuitive abilities (114). Greater sensitivity to tones, sounds, melodies, and recognition of faces has been demonstrated by female infants, but not male, as early as four months of age. Because female infants hear better, they also learn to speak more readily and quickly than males, a superiority they retain throughout most of their lives, according to Restak (114:58). This ability enables them to pick up significant information from tones of voice, expression, and other nonverbal cues that males often miss and which help explain their intuitive superiority (114:123).

Additionally, Restak indicated that the female brain was less lateralized; that is, the brain processes were more integrated and less separated into right and left processing

than the male brain. Therefore, females had a more integrated and holistic view of the world, which Restak saw as an advantage, in most cases. The greater lateralization of most males did, however, give them an advantage in mathematics, according to Restak (114:151). His main point was that real differences do exist in the brain processing of men and women. He hastened to add that one brain was not superior to the other, but rather that major differences could be demonstrated (114:191).

Weintraub (147:15-20) reported several additional tests that supported Restak's position. One hypothesis suggested that sex hormones affected the development of the brain. Testosterone, the hormone that produces masculine physiological characteristics in the body, appeared to masculinize tissue in the hypothalamus and other nearby structures in the male brain during fetal development. Estrogen, a female hormone, appeared to feminize the brain tissue in the surrounding cerebral cortex in a similar way. According to Weintraub, experiments with hormones on animals supported this hypothesis.

Levy (84:66-71) a leading neuropsychological researcher, concurred with much of the previously mentioned research. She noted that other studies showed that children who reached puberty earlier than normal had less lateralized brains, indicating a further role for sex hormones in the lateralization process. Since girls usually reached puberty

two years earlier than boys, their brains automatically had less time to lateralize. This factor, Levy noted, might provide the scientific evidence for female superiority in intuition and male superiority in math.

Ethnic Background. Reynolds, and others (115:180-184), suggested that several ethnic minorities had right hemisphere dominance. Since intelligence and other aptitude tests rely heavily on left hemisphere information processing, previous score differences could be partly explained by the difference in brain dominance. In their testing of one hundred and thirty-two Blacks and Caucasians, matched for other demographic values, these researchers found a positive correlation between the size of score difference and the judged degree of left hemisphere involvement in the task. While the authors were quick to emphasize the tentative nature of their results, because of the actual size of the correlation, they believed that the results merited further investigation. Agor's results (4:68), however, did not indicate a right hemisphere preference for Black managers. In fact, their management style was more left-brain than the average manager in the study. According to Agor (4:71), perhaps Black managers have adopted the left-brain emphasis of the majority culture in order to become managers.

Ross (123:2-5) noted that Native American Indian education and culture involved more right-brain processes

than did most other Western cultures. Their use of symbols, stories, and dreams, as well as their perceptiveness in scouting, hunting, and tracking illustrated this right-brain ability. Indian cultures do not differentiate between time and space, as evidenced by the nonlinear nature of their languages and their lack of interest in Western time values. Brain processing dominance for most Indian people, according to Ross (123:4), would clearly be right-brain.

Pascale and Athos (109) noted that Japanese and other Asian families encourage right-brain skills more than Western families. The Asian approach to life has traditionally included an emphasis on values, spirituality, indirect methods of problem solving, and synthesis, as well as an emphasis on analysis. The practice of these right-brain skills, along with the analytical, has created a different kind of manager in the Japanese. Similarly, Agor's results indicated that Asian managers have a higher level of intuitive ability and were more likely to prefer an integrated management style than was the average manager who responded (4:87).

Intuition in the Armed Forces

Introduction. According to Clausewitz, the climate of war consists of "danger, exertion, uncertainty, and chance" (49:104). He further explained how the challenges of danger and exertion are compounded by the uncertainty of

information: "Many intelligence reports in war are contradictory; even more are false, and most are uncertain" (49:117).

A Military Perspective. In 1987, Fastabend did a study for the United States Army to assess the role of quantification in the Army's tactical decisionmaking. According to Fastabend (47), tension exists between the intuitive requirements and quantitative considerations of military science, in terms of effective military decisionmaking. For him, the United States Army's approach is primarily intuitive with little quantitative foundation, whereas the Soviet Union is characteristically quantitative. He assesses U.S. Army officers of the 1980's as holistic and intuitive thinkers (47:13) and believes that unless a balance is developed between the analytical and intuitive requirements of war, the United States' ability to resolve armed conflict in its favor is questionable (47:3-13).

Fastabend purports that the Soviets maintain that there is a best, objective solution to every military problem (47:14). They base their quantitative approach to military employment on a warfighting decision support system which is designed primarily for information storage and retrieval; tactical planning calculations; decision evaluation; and transmission of commands (47:19). Though viewed by many

U.S. analysts as rigid and over-centralized, Fastabend contends that Soviet-styled quantification blended with U.S. strengths in intuitive battlefield management would more amply meet the requirements of the modern battlefield (47:20-24).

> Initial periods of combat may well be decisive in the next war. The United States no longer has the luxury of a prolonged period of intuitive tactical learning and experience generation. The projected tempo and expense of modern battle eliminate the prospect of experiential learning.... Troop control procedures will not have the time to evolve during combat: the initial command and control procedures may prove to be decisive. (47:27)

Fastabend concludes his assessment of the modern Army officer by profiling the ideal officer as one who is analytically and intuitively balanced. Quoting B.H. Liddel Hart's prescription for tactical genius, he describes that ideal:

> Creative imagination is the essential characteristic of genius..., and when coupled with dynamic energy, it produces an executive genius. When balanced by cool calculation, it makes a Great Captain. (47:40)

General Alfred Gray, Commandant of the U.S. Marine Corps, has ideas similar to Fastabend, but from the opposite perspective. He sees "too many intellectuals" at the top of the military services and states that what the U.S. Armed Forces need are "oldfashioned gunslingers," people "who like a good fight" (35:b1). Gray's profile is characteristically intuitive in nature (4; 59).

A Civilian Perspective. Campbell, a psychologist and faculty member at the Center for Creative Leadership in Colorado Springs, Colorado, has studied one hundred and sixty of the Army's four hundred generals, mostly brigadier grade. He profiles a distinct personality type which he calls the "Aggressive Adventurer" (35:b1). He describes the profile as

> ...dominant, competitive, action-oriented, patriotic men who draw naturally to physically adventuresome, militaristic activities, and who are repulsed by artistic, literary, musical and nurturing activities. (35:b1)

Campbell's assessment is remarkably similar to two of Leigh's characterization of senior executives whom Leigh calls "Hard Chargers" and "Power Brokers" (82:36). Leigh profiles the former as ones who believe in tradition, follow rules, and see prescribed ways of doing things and the latter as innovative and resourceful, especially good at motivating people, and ones who thrive on challenges (82:36). Using the MBTI, the profiles would be classified as ST/SJ and SF/SP respectively. Neither profile is intuitive in nature, contrary to Fastabend, as their repulsion to artistic, literary, musical and nurturing activities would indicate (35:b1).

Campbell further described the general officers as having a high sense of integrity and social responsibility, and as being decisive, judicious warriors. Campbell finds

that the generals studied tend to be conventional in the face of new ideas, but he nevertheless says that the military as a whole is moving toward

> ...leaders who have a healthy skepticism toward the use of military action to resolve international disputes..., and creative leaders who value the world of innovation. (35:b2)

Campbell concludes his assessment by stating that we are moving into an era where "diplomatic ingenuity, interpersonal sensitivity and creative vision" will be the necessary ingredients of military leadership (35:b2).

Agor, in his study of military personnel, noted that better than two to one of those tested showed left-brain dominance (logical, analytical, linear, verbal) as opposed to right-brain dominance (intuitive, spatial, relational, imagistic, non-verbal) (4:27). His findings are supportive of Campbell's studies and Gray's comments but are incongruent with Fastabend. Furthermore, he found that an intuitive-integrated profile was twice as likely to be found than an intuitive profile alone (4:25). Lastly, Agor consistently found more female intuitive-integrated as well as intuitive personality orientations than in equal numbers of males (4:25).

A computer data bank of more than 250,000 Myers-Briggs Type Indicator (MBTI) records generated from the MBTI scoring program at the Center for Applications of Psychological Types produced a profile of occupations

empirically attractive to the four MBTI bi-polar personality groups and the sixteen MBTI personality types. The occupational profile is of interest to this research because it gives a personality type breakdown by percent of both military personnel in general and Air Force personnel in particular and shows affinity for right- and left-brain dominance. Tables 4 and 5 depict that data by the four bi-polar groups and the sixteen personality types, respectively (102:243-292).

Table 4. Percent of Personality Dominant Characteristics by the Four MBTI Bi-polar Personality Groups (102:243-253)

	Air Force Personnel N = 73	General Military Personnel N = 264
Extraverted	46.58	53.41
Introverted	53.42	46.59
Sensing	63.01	64.39
Intuition	36.99	35.61
Thinking	57.53	57.23
Feeling	42.47	42.77
Judging	58.90	61.74
Perception	41.10	38.26

Table 5. Percent of Personality Dominant Characteristics by the Sixteen MBTI Personality Types (102:253-292)

MBTI Personality Type	Air Force Personnel N = 73	General Military Personnel N = 264
ST	42.47	42.42
SF	20.55	21.97
NF	21.92	20.83
NT	15.07	14.77
ISTJ	17.81	14.02
ISTP	9.59	7.58
ESTP	2.74	3.03
ESTJ	12.33	17.80
ISFJ	8.22	9.47
ISFP	1.37	1.52
ESFP	4.11	4.55
ESFJ	6.85	6.44
INFJ	2.74	3.41
INFP	6.85	6.06
ENFP	10.96	8.71
ENFJ	1.37	2.65
INTJ	6.85	3.03
INTP	0	1.52
ENTP	5.48	5.30
ENTJ	2.74	4.92

Intuition and the Decision Sciences

Introduction. Brain dominance (left-brain, right-brain, or integrated-brain) and its association with decisionmaking and the decision sciences is of basic importance to this study. The complexity of this association makes it difficult to separate the influencing factors and predict causality. Nevertheless, a distinction in brain dominance can be drawn, and the relationship of intuition to the decision sciences can be ascertained, beginning with a historical overview.

A Historical Perspective. Prior to the industrial revolution, decisionmaking was based more on intuitive processes than on science (49). However, once mechanization came to the fore, machines replaced raw labor and the "intimacy of the small shop was snuffed out in the smokestacks of big factories" (49:146). Individual output became a priority, and the manager's job was to extract the maximum efficiency from the worker. "What mattered was volume, output, unit cost, and product tolerances" (49:146). The manager was faced with the difficult task of managing based on pre-technology experience and intuition, often with catastrophic failures.

Even though Adam Smith extolled the merits of division of labor in 1776, and Charles Babbage expounded on skill differential in wages and concepts of industrial engineering in the early Nineteenth Century (28:3), it was not until

much later that an encompassing methodology was formally advocated. Then in the late nineteenth century, an American engineer, Frederick Taylor, advocated a scientific approach to manufacturing problems. (28:3; 49:147).

Taylor brought scientific management to industry. He developed specific techniques such as motion study, time study, production planning and control, plant layout, wage incentives, personnel management, and human engineering, all centering on efficiency and production (141). Because of Taylor, managers moved to a more defined, analytical, and pragmatic approach to decisionmaking.

In addition to the analytical school of Taylor, the behavioral school of thought also saw its place in the decisionmaking arena. Behavioral theorists reasoned that inasmuch as managers get things done through people (30:15), the study of management must be centered around workers and their interpersonal relations. Therefore, they focused their attention on motivation, group dynamics, individual drives and fulfillment desires, and group relations, to name a few (49).

This school, including most of the social sciences (psychology, sociology, social psychology, and anthropology), added another dimension to the decisionmaking process, that of understanding the relevant phenomena of intrapersonal and interpersonal relationships as they relate to work situations (49).

Between 1930 and 1950, an historically significant study occurred. Elton Mayo, of the Department of Industrial Research at Harvard University, led a team in conducting a study at Western Electric's Hawthorne Plant in Chicago. The now famous "Hawthorne Studies," as they came to be called, set out to evaluate the attibutes and psychological reactions of workers in on-the-job situations. Because of his work, a new dimension was added to the developing concepts of management--that to be effective, a manager must recognize and understand the individual as a person with wants, motives, drives, and personal goals that need to be satisfied (49:152). Because of Mayo's work, managers began to employ a new trend in management thought--one that considered the exacting benefits of Taylor's management engineering as well as one that did not lose sight of the psycho-social aspects of man and his machine (49).

As the business world became more managerially sophisticated and complex, the use of interdisciplinary teams of scientists came into being known as the quantitative school of management (1; 28:3). Often called operations research, operational research, or management science, this school consists of a synthesis of varied disciplines coming to bear on the study and effective resolution of managerial problems (28:2).

By definition, management science (or operations research) is "the discipline devoted to studying and

developing procedures to help in the process of making decisions" (28:2). It is a scientific method approach which utilizes all pertinent scientific tools to provide a quantitative basis for management decisions (28:2). As such, it routinely incorporates the five basic steps of the scientific method: observation; definition of the problem; formulation of a hypothesis; experimentation; and verification (28:6-7). Additionally, it involves the disciplines of mathematics, economics, computer science, and engineering (28:3).

According to Ackoff (1:265-266), a standard approach to solving problems using management science would be as follows:

> 1. Formulating the problem. This refers to both the consumer's [decisionmaker's] problem and the researcher's problem.
>
> 2. Constructing a mathematical model to represent the system under study. The system may include independent and dependent variables.
>
> 3. Deriving a solution from the model. This involves finding the values of the "control variables" that maximize the systems's effectiveness.
>
> 4. Testing the model and the solution derived from it. This involves evaluating the variables, checking the model's predictions against reality, and comparing actual and forecasted results.
>
> 5. Establishing controls over the solution. This involves developing tools for determining when significant changes occur in the variables and functions on which the solution depends, and determining how to modify the solution in light of such changes.
>
> 6. Putting the solution to work or implementation.

This more sophisticated scientific approach grew not out of mathematical or engineering models but rather out of Dewey's six steps of reflective thinking which served as a catalyst in the blending of management science and reflective thought (104:216-218). Dewey's steps include clarifying and defining the problem; generating solutions; weighing the solutions; selecting the best solution; implementing the solution; and evaluating the results (104:218).

Chester Barnard was one of the leading contributors to twentieth century management thought who systematically applied the evolving concepts of management science along with Mayo's philosophy of psycho-social considerations. Falling somewhere between the behavioral school and a systems approach to management, he was emphatic in his stance that a manager must use his faculties of managerial analysis, but only as those faculties are embedded in sound managerial intuition. He went so far as to say that in the final analysis, intuition must always be preferred above scientific management, if a tradeoff ever becomes necessary (16).

The management sciences have evolved to their present day use in one of two basic applications: decision oriented applications and decision process applications (28:655). The former is concerned with helping decisionmakers in making one-time, nonrecurring decisions, such as corporate

mergers or acquisitions. The latter is concerned with recurring problems. Each is by nature an element of a decision support system (28:659), and each involves varying degrees of structured and programmable decisions (31:33-36).

Of major importance in understanding the role of the decision sciences in the decisionmaking process, and especially their relationship to the intuitive process, is the well publicized caveat regarding their use: managerial insight and judgment are considered essential in the decisionmaking process, because the management sciences only provide supportive tools in making decisions, not the actual decision itself (28:660; 31:9,368).

> Most problems encountered by real-world decisionmakers require some degree of human judgment or input; very few real decision problems can be completely solved by the straightforward application of a decision model. (28:659)

Zeleny affirms this caveat and sees the challenge ahead for management science to be "the development of new ideas that will enhance the intuitive powers of managers" (28:681).

Decision Theory. Decision theory grew out of the evolving managerial/decisionmaking concepts of the early to middle twentieth century. It is a prescriptive form of analysis aimed at correcting intuitive judgments with formal models. Descriptive decision theory, on the other hand, attempts to identify the psychological mechanisms that generate the numerical estimates required for decision

analysis. Often, decisionmakers do not act in accordance with the theory of rational decisionmaking (45:488).

The manner in which a person evaluates a problem and makes a decision may follow several courses. Two helpful models of how decisionmakers make decisions are the classical economic (prescriptive) and administrative (descriptive) models.

The classical economic model is a normative or prescriptive model: i.e., "a model which tells the decisionmaker how to make a class of decisions" (31:169). It has the following assumptions (31:169-170):

1. All alternatives and all outcomes are completely known (decisionmaking under certainty).

2. The decisionmaker seeks to maximize profit or utility.

3. The decisionmaker is infinitely sensitive to difference in utility among outcomes.

This model assumes the decisionmaker is completely rational, has complete information, and always chooses the "best alternative" (31:170).

The administrative model is descriptive: i.e., "describes how decision makers actually make decisions" (31:169). It views decisionmaking as within a complex and partially unknown environment. The decisionmaker is assumed "to not be completely rational but rather to display rationality only with limits imposed by background,

perception of alternatives, ability to handle a decision model, etc." (31:170). The administrative model assumes that the decisionmaker

1. Does not know all alternatives and all outcomes.

2. Makes a limited search to discover a few satisfactory alternatives.

3. Makes a decision which satisfies his or her aspiration level (i.e., satisfices).

Simon, who proposed the administrative model, contends that it most realistically and pragmatically describes the actual decisionmaking process. He suggests that most problem solving strategies are not based on explicit decision rules, but rather on heuristics or rules of thumb (31:170) which are elements of intuitive decisionmaking (31:244). Write Davis and Olson in support of Simon's contention:

> There is substantial evidence...which indicates that the descriptive model of the decisionmaker...is more accurate. Humans utilize past experience, inductive inference, and intuition. The process of decisionmaking does not follow an algorithmic, "brute force" reasoning process, by which all possible alternatives in the search space are analyzed and an optimal solution is guaranteed. Instead, the decisionmaker utilizes heuristics, judgmental rules of thumb which eliminate alternatives without explaining them and thus reduce the search space. (31:244)

As a research strategy, decision theory identifies certain components as key to any decision and asks for data about each. These components are the probabilities of various outcomes resulting from any action and the value or

utility of each outcome. If an outcome has multiple components or attributes, the importance of each must be specified (45:489-493).

Decision theory relates the concept of intuition as it employs features of the decisionmaker--probability and utility (value) assessment--and offers a rule for combining these. In a sense, these approaches focus on opposite ends of the process, the former looking at factors in the cases that affect judgments and the latter at beliefs and values of the decisionmaker. Both are aspects of human intuition. Decision theory is also much more systematically concerned with risk and the cost of mistakes and is therefore very useful in tempering intuitive judgments (45:494).

Decision theory assumes that preexisting values are being elicited. It has been suggested that few people have internally consistent and coherent value structures, particularly regarding issues or situations they have not experienced. Since values are inherently subjective and personal, there is a problem of choosing criteria to determine whether a decision is biased or whether it is disclosing inconsistency and helping to correct for it (45:494-495). The question of rationality therefore comes into play.

Lee discusses rationality in decision theory by stating:

> Since decision theory concerns the use of reason in human decisionmaking, one must look at the role of reason in human affairs. (80:127)

Lee continues by saying that in decision theory, the rational man is he who, when confronted with a decision situation, makes the choice (decision) that is best for him. This best decision is called a rational or optimal decision and may not be perceived as rational by others.

The following are four characteristics of rational decisionmaking, according to Lee (80:7-9):

1. A rational decision is one (or more) of a specified set of possible decisions.

2. The rational decision depends on the decision principle employed by the investigator.

3. The rational decision for a decision situation may differ among persons.

4. A rational decision is dependent on relevant information available to the person.

In the final analysis, one may or may not use instruments of analysis (tools of management science) at one's disposal in making a decision, but the ultimate decision and determination of its rationality rests with the decisionmaker.

Decisionmaking. Research into how decisions are made (i.e., the use of cognitive style and the use of information and information systems) has shown that decision behavior is very complex and variable (13). According to Davis and

Olson, "two individuals rarely follow the same decisionmaking process, even if they make the same choice" (31:251).

McKenney and Keen (95) developed a model that classifies individual style along the two continua of information gathering and information evaluation (see Figure 1). The information gathering dimension relates to the perceptual processes: how the mind organizes verbal and visual stimuli. One end of that continuum is the preceptive individual who focuses on relationships of data and generalizes from the data about the environment. At the other end of the continuum is the receptive individual who concentrates on details and uses the details to understand the data environment.

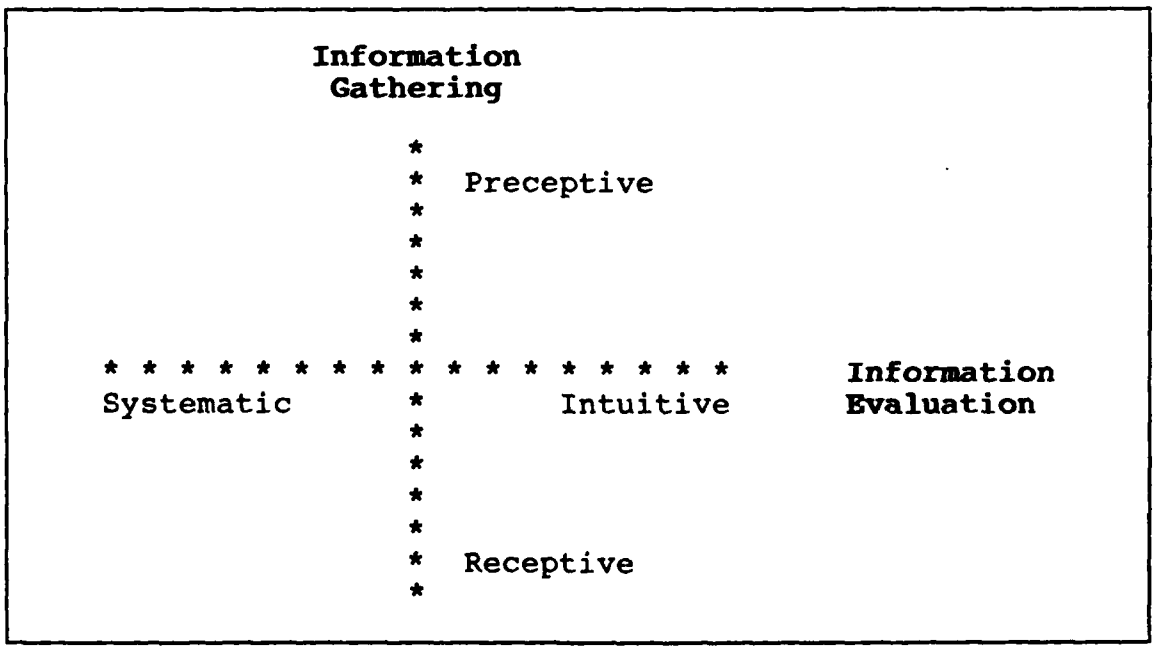


Figure 1. McKenney/Keen Model of Cognitive Style (95:81)

The information evaluation dimension is concerned with how one analyzes the data. At one end of this continuum is the systematic person (the analytic) who uses a structured and deductive approach to find a solution. At the other end is the intuitive (or heuristic) individual who "uses trial-and-error strategies, acts spontaneously on the basis of new information, and responds to and incorporates nonverbal cues" (31:251). An architect might be a person who is characteristically receptive and intuitive whereas an economic analyst might be systematic and preceptive.

For Davis and Olson,

> Cognitive style is a continuous variable. For example, a person is not heuristic or analytic but is more or less heuristic. Furthermore, the task to be performed frequently has more influence on the decision style selected than the preferred style of the decisionmaker. Finally, humans have a high capacity to adapt. A person with heuristic bias may adapt fairly easily to an analytic decisionmaking procedure. Education and training may have a greater effect on cognitive style in a given situation than natural tendencies. (31:252)

Information gathering and information evaluation are foundational aspects of systems that support decisionmaking. Management information systems (MIS) and decision support systems (DSS) are typical among such systems. The success of these systems depends on understanding individual behavioral decisionmaking variables and designing systems to support such variables (86:27).

Writes Markus and Robey,

> However cognitive style is conceived, it is likely that compatibility between the style of the user and the nature of information support would affect use and performance with an MIS. Some decisionmakers are analytical, requiring complete and detailed documentation. Others are more intuitive and heuristic, preferring to use partial information to get the "big picture" without details. Intuitive decisionmakers may dislike an MIS that provides reams of information in tabular format. Analytical decisionmakers, conversely, may not use an MIS which provides summary data, because they view it as incomplete. (90:208)

Over thirty years ago, Weinwurm "warned about the need for better understanding of human factors in management science" (74:416). Nearly two decades after Weinwurm, Lucas developed his "Descriptive Research Model" of information systems in the organizational context (74:29-36). In that model, Lucas specifically identified decision style as a variable class and operationalized that class by the "intuitive decision approach" and the "analytical decision approach" (74:32). For Lucas, "individuals with differing decision styles have differing levels of use of information systems, perform different analyses of data, and take different actions based on information" (74:33).

Understanding that individuals use information differently, predicated on cognitive style, gives useful insight into the complex and variable nature of decision behavior (13).

Drucker felt that the character of a decision is determined not only quantitatively but also by considering

the many qualitative factors that enter into it: basic principles of conduct; ethical values; and social and political beliefs.

> The moment value considerations have to be taken into account, the decision moves into a higher order and requires either determination or review at a higher level. And the most important as well as the most common of all qualitative factors are human beings. (41:199)

Even when a manager utilizes the scientific process for decisionmaking, the ultimate decision is affected by the nature of the problem, the organizational contact, the basic personality characteristics of the decisionmaker, and the cognitive limitations of human beings which stem both from situational and personality factors (71:288-290):

> In addition to the general cognitive limitations of human thinking, organizational decisions are affected by deep-seated orientations of personality, those attributes which individual decisionmakers bring with them because they are what they are. (71:290)

Levey introduced a simplified decision model. Within his model, he discusses decisionmaking under certainty, decisionmaking under risk, decisionmaking under partial information, and decisionmaking under uncertainty. Of decisionmaking under uncertainty, he recommends that to identify the optimal strategy one must apply some choice criteria which in real-life situations can be either subjective or one of the rational criteria developed by decision theorists (83:170-181).

> However, the importance of the personal value system in decisionmaking cannot be ignored; it is especially significant for choosing a specific course of action under the uncertainty framework. (83:178)

Robbins noted the importance of judgment, creativity, experience, and quantitative analysis as requirements of the decisionmakers. He goes on to state that a

> ...variety of complex factors affect decisionmaking: the social, cultural, economic, and political backgrounds of the individual participants; the values of the decisionmaking body as an entity in itself; the pressures on the decisionmakers, individually and collectively, and by special interests groups. (119:315)

Szilagyi and Wallace agree with Robbins that the direction of the decisionmaker's search for alternative actions is often influenced by "personal perceptions, values, beliefs, experiences, and training" (141:315).

Sperry perhaps best sums the explicable role of beliefs and values on man's intuitive nature and decisionmaking by saying:

> A substantially altered picture of causal determinism in behavior is now inferred in which all subjective mental phenomena, including subjective values, are recognized to have a causal role per se in the decisionmaking process, rather than being mere correlates or aspects of a self-sufficient brain physiology. In any decision to act, the conscious mental phenomena override and supersede the component physiological and biochemical determinants. Even subjective feelings about projected outcomes anticipated to result from a given choice as far as 25 to 100 years in the future may be entered proactively as causal determinants in the cerebral operations that lead to a given choice. (144:53)

Stice recognizes the inherent value and place of individual personality, as delineated by Levey, Robbins,

Sperry, and others, and developed a basic decisionmaking model predicated on the MBTI personality types. He suggested the following as a decisionmaking model:

> First, use sensing (S) to face facts, to be realistic, to find exactly what the situation is, to see your own actions, and to see other people's actions.... Second, use intuition (N) to discover all the possibilities, to see how you might change the situation, to see how you might handle the situation differently, and to see how other people's attitudes might change.... Third, use thinking (T) to make an impersonal analysis of the problem; to look at causes and their effects; to look at all the consequences, both pleasant and unpleasant; to count the full cost of possible solutions.... Fourth, use feeling (F) to weigh how deeply you care about what your choice will gain or lose; to put more weight on permanent than on temporary effects...and weigh other people's feelings and your own feelings in deciding which solution will work best. (138:44-45)

However, it wasn't until Agor decisively qualified Jungian typology along management style lines that a synthesis of decision theory, decisionmaking considerations, and individual personality characteristics emerged.

Agor on Intuition and Decisionmaking.

Introduction. In the early 1960's, McGregor's research into management styles led him to his Theory X/Theory Y classification of managerial style (93). Theory X assumes that one dislikes work and must be coerced, controlled and directed toward organizati[illegible]: Theory Y emphasizes a personal intrinsic in[illegible]est in[illegible]s work; one's desire to be self-directing [illegible]d t[illegible]k responsibility, and one's capacity to be creative in solving problems.

Shortly after McGregor's theory received wide publicity, Blake and Mouton promulgated their managerial grid, which was a tool used to determine the value one placed on people as a resource and production as a measure of effectiveness (20). Blake and Mouton's twenty-question test resulted in a grid score showing a manager's style relative to the two variables: high or low concern for people and high or low concern for production, with relative combinations thereof.

McGregor, Blake, and Mouton highlighted foundational considerations of managerial perspectives and exposed implications for managerial decisionmaking. Others, such as Fiedler and his contingency theory of leadership and Likert and his theory of participative management, continued to address subjects that sought integration of the managerial process and its corresponding role in decisionmaking.

It was not until the early 1980's that the relationship of management science, decision theory, brain research, and psycho-social considerations was publicly championed. Weston Agor, Professor of Public Administration at the University of Texas, brought an interdisciplinary framework to decisionmaking in studies on managerial intuition (2; 3; 4; 5; 6; 7; 8; 9; 10).

Agor's Management Psychology. Agor believed that organizations and managers of today utilize three broad types of management styles for making decisions. The first

is based on left-brain function. This decisionmaking approach uses the traditional, quantitative, and analytical approach. It is deductive (general-to-specific) and relies on facts to make decisions. It lends itself well to management situations that are structured and carefully planned. The method for solving problems is basically the scientific method, as discussed earlier, predicated on logic and reasoning.

The second type of management style is based on right-brain function. It uses inductive reasoning (specific-to-general) and relies more on global impression to make decisions. This style is more acceptable in collegial and participatory management structures. It lends itself best to management situations that are unstructured, fluid, and spontaneous. A manager utilizing this approach will look at the whole but approach the problem through patterns using hunches or intuition.

The third style is one of integrating both left- and right-brain styles and using them selectively. Managers who employ this style use both facts and feelings when making decisions. These managers make their decisions led by intuition after pursuing all available facts and receiving input from the management resources/personnel in the organization. Frequently, the intuitive decisions which are made are in direct conflict with the suggested outcome based

on facts and logic. Agor feels that the most ideal management style is one of integration.

Agor bases his conclusions on his own research which describes the actual management style of the individuals as the highest self-reported scores on left-brain, right-brain, and integrated-brain. He also describes their potential capability as the highest score between intuition and thinking. Lastly, he states their management type by combining both of the highest scores.

For Agor, if the actual management style is left-brain, it implies that the person favors deductive, logical, and analytical processes in making decisions. If the actual management style is right-brain, the person favors inductive and subjective processes instead. An integrated score means that the individual prefers to use both left-brain and right-brain processes selectively, depending on the task or situation at hand. Davis and Olson agree (31:253-254).

If the potential capability is intuitive, the individual has the requisite ability to make intuitive decisions based on unknowns and possibilities. On the other hand, if he scores a thinking profile, the individual prefers to make decisions based on facts and information known to him. Agor concludes that if the individual has a tie score on either or both parts of the test, he most likely has difficulty deciding which cues (the facts, his feelings, or both) to listen to and act on. This is evident

in the tension he experiences when making a choice between the cues he is receiving. These concepts are consistent with Myers-Briggs descriptions of the four bi-polar groups.

Agor states that the most productive management types include left-brain/thinking, integrated/thinking, integrated/intuitive, and right-brain/intuitive. The least productive management types include left-brain/intuitive and right-brain/thinking.

From 1981 to 1983, Agor tested 2000 managers across the United States in a wide variety of organizational settings (business, government, education, military, et. al.), at all levels of management responsibility and in various occupational specialties. He utilized an instrument entitled "Test Your Management Style" (to be discussed in Chapter III). Agor determined that the ability to use intuition is found to a greater degree at the higher levels of decisionmaking. Others, such as Lyons (87) and Roach (118), agree.

Furthermore, Agor found that top managers also seemed to be sharply different from their subordinates in the brain dominance style they actually used on the job. An integrated-brain style was not commonly practiced at the top levels of all organizations sampled. As seen earlier on findings on demographic considerations, women scored higher than men on the intuition portion of the survey, as did those managers with an Asian background and managers with

increased experience. Lastly, when looking at job satisfaction, the vast majority of the managers who were unhappy with their present occupation had selected an occupational specialization that did not comfortably match either their management style preferences or their underlying potential capability.

From the managers that Agor surveyed, he deduced the most typical management style and the least typical management style for four different styles. They include, respectively, engineering--left-brain/thinking and integrated/thinking; administration--left-brain/thinking and integrated/thinking; art production--integrated/intuitive and right-brain/intuitive; and those positions requiring a high degree of creativity--integrated/intuitive and right-brain/intuitive.

Intuition, Decisionmaking, and the Future

The Future Environment. Futurists John Naisbitt, Willis Harman, and Alvin Toffler project that we are entering an era of "turbulent times," a period in which the political and economic climate will be characterized by "rapid change, crisis, and major structural dislocations" (3:15). Along with these futurists seeing technological advances as being "astronomical" (3:15), Agor sees the era ahead characterized by incomplete data, in terms of being unavailable, inadequate, and too costly (8:49). Since a

more complete data base is needed for left-brain dominant decisionmakers to perform adequately (3:15), the "extremely complex management problems" that will arise will prove to be too formidable for the left-brain dominant decisionmakers (3:15). Until now, states Agor, management's approach to problem solving has predominately been via a left-brain style, stressing logical, analytical, linear, and deductive reasoning (8:49). For Agor and others (4; 51; 124), major efforts must be made to develop right-brain (intuitive) skills in hope of achieving an integrated approach (i.e., both left- and right-brain skills) to decisionmaking (10:49).

According to Agor, Rowan, Goldberg, and others (2; 3; 5; 7; 8; 10; 51; 124), tomorrow's decisionmakers will need to make increasing use of intuition to effectively guide their organizations through the upheavals ahead. Agor specifically states that "highly intuitive managers have special skills that are likely to become more valuable in tomorrow's rapid change environment" (2:42) Shigeru Okada, the head of one of Japan's largest department stores, gives credence to this projection by stating that the primary reason for his company's success was "our adoptions of the West's pragmatic management combined with the spiritual, intuitive aspects of the East" (8:49; compare 3; 10:51).

Nurturing Intuition. Several universities are beginning to offer courses in their MBA (Master of Business

Administration) programs that will develop right-brain skills. Stanford University's course on "Creativity in Business" is but one example (3:15; 8:50; 10:50). According to Agor, by 1990, leading management training programs, both public and private, "are likely to place just as much emphasis on the training of intuition...as they presently do on deductive, analytical left-brain skills" (8:51; compare 3:23).

Thomas Peters and Robert Waterman, Jr., in their book In Search of Excellence, reported that the ten best-run companies in the United States encourage the use of intuitive skills and nurture its development in their management environments (110). According to Agor, such companies foster an environment for "entrepreneurs, change masters, and corporate reinventors" (7:43). What should be of concern, states Agor, is that "organizations often thwart, block, or drive out this talent--the very talent they require for their future survival" (7:43).

In discussing a "discouraging environment" for intuitives, Agor lists the following (7:43):

1. New ideas are not encouraged.
2. Senior managers select clones (those who think like they think) to fill key positions.
3. Unconventional approaches/methods to problem solving are resisted.
4. The value of intuition is not recognized by an organization's leadership.

For Agor, to achieve higher productivity, an organization needs to create a climate "in which intuitive brain skills and styles can flourish and be integrated with more traditional management techniques" (7:43). This, according to Agor, can be accomplished by a "Brain Skill Management Program" (6; 7).

A Brain Skills Management Program. In the face of future challenges for decisionmakers, which were previously discussed, Agor recommends the development of "Brain Skill Management Programs," similar to one he designed for the Hawaii Telephone Company (6; 7). According to Agor, the morphology of such a program should contain the four following elements (7:42; compare 6):

1. Systematic search for an appropriate use of the intuitive talent your organization already has and/or requires.

2. Systematic integration of this talent with more traditional management approaches to solve critical problems or issues.

3. Systematic development of the intuitive talent within your organization for applied problem solving.

4. Creation of a supportive organizational environment in which this program can be implemented.

The determination of intuitive types within an organization can be done by the use of instruments like the Myers-Briggs Type Indicator (MBTI), discussed earlier, or "Test Your Management Style" questionnaire, to be discussed in Chapter III. Such tests may also be used to enhance communications between left-brain and right-brain dominant

personnel within an organization. The Walt Disney Company did just that. They used brain style tests to "enhance communication by simple understanding between intuitive 'imagineers' (artists, writers, craftsmen) and analytical 'engineers or financiers'" (8:52).

Factors Bearing on Intuition. Several authors and researchers have contributed to a pool of data on factors that impede the use of intuition and factors that facilitate or enhance intuition. A compilation of the most common factors can be found in Tables 6 and 7.

Table 6. Most Common Factors That Impede the Use of Intuition (4; 5; 51; 124; 144)

1.	A low degree of acceptance or confidence in intuition
2.	Failure to be honest with oneself (self-deception or pretense)
3.	Low self-esteem
4.	Wishful thinking
5.	Let ego involvement cloud judgment
6.	Time constraints (rushed decisions; did not get facts; did not do homework; acted impulsively)
7.	Stress factors (fatigue, physical/emotional tension)
8.	Taking oneself, work, dilemmas, or problems too seriously
9.	Lack of confidence (anxiety; fear; confusion)
10.	Constrained by analytical procedures in favor of a degree of informality
11.	Unflexible style or environment

Table 7. Common Factors that Enhance Intuition (2; 4; 5; 51; 124; 144)

1. Value intuition and seek to develop and practice it.
3. Tune in to your inner and outer cues and be completely honest with yourself.
4. Be open to experiences.
5. Be willing to experience your fears, confront them, and not fear failure.
6. Be nonjudgmental.
7. Be willing to let things be as they are.
8. Use of relaxation techniques (clear mind mentally; sleep on it; meditate; pray; joke; exercise).
9. Perform mental exercises.
    a. Play freely with ideas without a specific goal in mind.
    b. Practice tolerating ambiguity and accepting lack of control.
    c. Practice flexibility, openness.
10. Perform analytical exercises.
    a. Discuss problems with colleagues who have a different perspective.
    b. Immerse self totally in the issue at hand.
    c. Consider problems only when alert.
    d. Analyze dreams and learn when and how to heed them.
11. Develop a support group (friends and colleagues with whom you can share the experience of intuition).
12. Keep a journal of intuitive insights; test them over time, and learn how to discern and trust your intuition.
13. Practice love and compassion and nonverbal expressions such as music or art.

Though they are tantamont to "laundry lists," each research source stressed that the development of intuitive skills was an individual endeavor that required experimentation and conscious application.

Agor developed a continuum of brain skills and styles that was designed to give decisionmakers and managers a visual perspective on what kinds of tasks and style of cognitive activity were best suited for thinking and intuitive people. His continuum may be found at Table 8.

Table 8. The Continuum of Brain Skills and Style (7:43)

THINKING SKILLS AND STYLE	INTUITIVE SKILLS AND STYLE
Task Preference	**Task Preference**
Routine Precision Detail Repetition Implementation	Nonroutine Broad Issues Idea Generation Constantly new assignments
Style	**Style**
Deductive Objective Prefers solving problems by breaking them down into parts then approaching the problem sequentially and logically	Inductive Subjective Prefers solving problems by looking at the whole, then approaching the problem through hunches and insights

In a similar fashion, Westcott sought to profile the intuitive personality as regards taskings and decisionmaking. In the late 1960's, Malcolm Westcott, of

York University in Toronto, conducted extensive empirical research on intuition and decisionmaking (51:107-110). Westcott had his subjects solve problems using both analytical and intuitive methodologies. As a result of his research, he characterized intuitive decisionmakers as shown in Table 9. Though there are limits to Westcott's

Table 9. Westcott's Characterization of Intuitive Decisionmakers (51:107-110)

1.	Unconventional and comfortable in their unconventionality
2.	Confident (they were more sure of their answers on the test than those who waited for more cues)
3.	Self-sufficient (they didn't base their identities in membership in a social group)
4.	Emotionally involved in abstract issues, either in intellectual, academic terms or in human values (the distinction might be similar to the Jungian NT and NF)
5.	Willing to explore uncertainties and entertain doubts, and able to do so without fear
6.	Willing to expose themselves to criticism and challenge
7.	Able to accept or reject criticism as necessary
8.	Willing to change in ways they deemed appropriate
9.	Resistant to outside control and direction
10.	Independent
11.	Foresighted
12.	Spontaneous

generalizations (51:108), his categorizations are useful in depicting personality types and equivalent type taskings within an organizational setting.

For Agor, as with Westcott,

> Intuitive skills are particularly effective when there is a high level of uncertainty, where there is little previous precedent on which course of action to take, where facts are limited, when time is limited by market conditions, and where there is pressure to be "right." (7:44)

Since most tasks require both rational/analytical thinking as well as intuitive thinking, Agor stresses that effective problem resolution necessitates "placing the proper skill [analytical versus intuitive] in the proper sequence of the decisionmaking process" so that the task can be most effectively and efficiently concluded (7:44).

Summary

Throughout history, intuition has been a concept man has struggled with as he sought to understand himself and the world he lives in. Irrational by nature, since it is not the result of reasoning or a rational process, intuition focuses around the mental activities of perceiving and judging.

The historical literature generally recognizes that man has the power of intuition; that intuition is a prime agent of truth; that intuition is indeed mysterious and illusive;

and yet intuition leaves one with a strong conviction as to the truth, correctness, or value of its resulting ideas or decisions.

Carl Jung was one of the earliest theorists to classify human personality in terms meaningful to behavior and decisionmaking. He categorized intuitives as extraverted and introverted, recognizing in each that intuition was that function which transmits perceptions in an unconscious way. For Jung, the extraverted intuitives receive perceptions subconsciously from the external world while introverted types receive them second hand, as it were, from their own subjective consciousness.

Jung's personality typing become more pragmatic and applicable when it was incorporated in the early 1960's into a tool useful for personality type identification. That tool, the Myers-Briggs Type Indicator (MBTI), has become useful in identifying intuitive personality types and has demonstrated over time "that much seemingly random variations in human behavior is actually quite orderly and consistent, being due to certain basic differences in the way people prefer to use perception and judgment" (102:1).

Several researcher correlated intuition and creativity, showing creativity to be one of the most explored aspects of intuition and one of the most applicable to decisionmaking. Synthesizing new and old, and moving between multi-spheres of consciousness, intuition is identified with creativity in

all its fullness, being equated to "Galileo's il lume naturale, Newton's leap of the imagination, and Gauss' 'sudden lightning flash'" (125:170).

Brain research adds a perspective heretofore not available in the study of intuition. It shows the bi-lateral nature of the human brain; the resident seating of human mental activity; and the effect of body hormones on gender hemispheriscity. Researchers into the relationship of brain dominance and demographics revealed that brain dominance causes occupational specialty polarity; that right-brain (intuition) orientation tends to be the dominant characteristic of more senior executives; and that women and members of oriental cultures seem to be more characteristically intuitive.

Studies conducted on Armed Forces personnel revealed a mixed assessment, the majority opinion being, however, that military personnel, the Air Force in particular, were more left-brain (logical/analytical) in orientation.

A comparative analysis of the literature concerning intuition and the decision sciences resulted in a common thread of thinking: that is, that both a soundly developed intuition and effectively applied decision sciences methodology were needed not only to tackle the tough structured and unstructured problems of today, but to also creatively and imaginatively undertake the challenges of tomorrow. Peters and Waterman, in their book In Search of

Excellence, most typically made the point that decisionmakers need a finely honed intuition, and companies that hope to succeed will encourage and nurture the development of intuition in their management environments. The challenge for corporate management then lies in "placing the proper skill [analytical versus intuitive] in the proper sequence of the decisionmaking process" so that the tasks at hand can be most effectively and efficiently concluded (7:44).

In the following chapter, the research methodology will be examined. It will explore the research hypothesis, research design, and data collection instrument, among others. In latter chapters, the content of this literature review will again be addressed as past findings are compared to the findings of this research.

III. Research Methodology

Introduction

This chapter presents the research methodology. It begins with the test hypothesis, explores the research design, and examines pertinent factors such as the research instrument, sample population, and data analysis. It concludes with an examination of the criterion test.

Test Hypothesis

The test hypothesis, which is predicated on the research hypothesis of Chapter I, is as follows:

Ho: United States Air Force field grade officers do not characteristically use analytical, logical, and rational thinking in their decisionmaking processess.

Ha: United States Air Force field grade officers characteristically use analytical, logical, and rational thinking in their decisionmaking processes.

Research Design

This was a non-experimental, survey-correlational study containing quantitative and qualitative data. As such, its theoretical design was to survey a large population to discover the relative incidence, distribution, and interrelations of sociological and psychological

variables (73). Additionally, as a survey-correlational study, this design attempted to determine the extent to which two or more variables were interrelated.

A survey research methodology was chosen because of the following reasons (66:10-11,16-19):

1. Variables: The strength and range of individual variables is high.

2. Control: The control over alternative explanations of the effect on the dependent variables is low.

3. Artifacts: The potential for researcher expectancy effects is low; potential for this researcher to convey perceptual cues to the subjects about the hypothesis being tested is low; the obtrusiveness or conspicuousness of this researcher to the subjects is low.

4. Setting: The naturalness of the survey setting is high; the potential for the research setting to influence the subjects is low.

5. External Validity: The applicability of the results to different populations or sub-populations is medium to high.

6. Reliability: The extent to which the results are free from measurement errors is medium to high.

7. Effectiveness: In terms of being comprehensive, the "potential for the survey methodology to yield a large ratio of potential information from the study to the

potential information inherent in the referent situation" (66:19) is medium.

8. Nature of the Results: Quantitative and qualitative.

9. Time Perspective: The survey methodology is best suited for the present and the future.

The reasons mitigating against the use of a survey methodology are (66:10-11,18):

1. External Validity: The general applicability of the research results to other settings or environments is low to high.

2. Internal Validity: The potential for determining that "the independent variable (and nothing else) caused the observed effects on the dependent variable" is low.

3. Effectiveness: In terms of efficiency as a dimension of effectiveness, the "potential for the methodology to yield a large ratio of accountable information to potential information from the study" is low.

Research Instrument

The research tool for this study was the same tool utilized by Agor (4) in his 1981-1983 research (see Appendix A; see Appendices B and C for reprint request and permission granted). Agor compiled his tool by joining portions of the Human Information Processing Survey (HIPS) and portions of the Myers-Briggs Type Indicator (MBTI) that measure intuition and sensing.

Agor's tool, entitled "Test Your Management Style," is a thirty-one-question, multiple choice instrument divided into three parts.

Part I contains fifteen questions which provide three scores, one for right-brain processing, one for left-brain processing, and one for integrated-brain processing. The highest score of the three categories indicated the brain hemisphere preference of the subject, according to the way the subject actually operated on the job. These questions were selected from the Human Information Processing Survey.

Part II, the next twelve questions, provided two scores: one for potential thinking ability and one for potential intuitive ability. The higher the score indicated the subject's greater underlying potential ability, but was not necessarily related to use on the job. This section of Agor's test was selected from the Myers-Briggs Type Indicator.

Part III contains four questions on occupational specialty, management level, satisfaction with current job, gender, and ethnic background.

Human Information Processing Survey. The questions of Part I were originally developed by E. Paul Torrance and are a portion of the Human Information Processing Survey (HIPS). The HIPS test included the right-, left-, and integrated-brain processing as a portion of creativity assessment. The instrument measured creativity as a

combination of right- and left-brain activity, which encompassed implementation as well as generation of new ideas (142).

Reliability tests for the HIPS were compiled by Torrance in 1977 in studies of fifty undergraduate students. The tests resulted in Pearson Product-Moment Coefficient of Correlation r of .84 for the right hemisphere, .86 for left hemisphere, and .82 for integrated style scales. A subsequent test of thirty-two graduate students showed reliability coefficients of .74 for right hemisphere, .78 for left hemisphere, and .79 for integrated style scales. In addition, Denny and Wolfe's 1980 sample of one hundred and seventy undergraduate students yielded a reliability coefficient of .84 (142).

Content validity was established by item analysis as well as expert judges who reduced the original fifty items to forty in 1977. Construct validity has been indicated by twenty-six separate studies conducted by thirty-six researchers from 1977 to 1983 (142).

Myers-Briggs Type Indicator (MBTI). The questions in Part II were selected from the Myers-Briggs Type Indicator. They assessed whether persons utilized intuition or sensing in their decisionmaking processes. The MBTI has been accepted since the early 1960's as a reliable and valid instrument for identification of Jungian types, including inquiring into a subject's preference for sensing (which

Agor calls thinking) and intuition (102). Myers reported that reliability statistics for these portions of the instrument were obtained by applying the Spearman-Brown prophecy formula. From a sample size of twenty-two thousand participants, Myers reported a test reliability for intuition of .70 to .86, while the range for sensing was from .44 to .86. A reliability score of greater than or equal to .75 was a benchmark criterion (102).

"Test Your Management Style." While the reliability and validity of the two original tests were well established, "Test Your Management Style" as a separate instrument combining portions of the two tests has had a shorter history. Developed as a method of identifying not only intuitive ability, but also the use of right- and left-brain skills in management situations, "Test Your Management Style" is the only current instrument which measures both. Agor noted that he used the HIPS and MBTI for his instrument since they both had good validity and reliability records (4).

Agor (4) inferred actual management style, potential capability, and management type from the scores obtained in Parts I and II. The actual management style (the way a person approached a task and people, and made decisions) was derived from the highest score between left-brain, right-brain, and integration. The potential capability was derived from the highest score between intuitive and

thinking scores. Finally, the management type was simply the highest score from the intuitive and thinking dimensions.

Sample Population

The sample population studied consisted of Air Force field grade officers (major through colonel) holding a regular commission. The total population was stratified for each of the three grades, and survey participants were selected by a computerized random selection algorithm. Specific population sizes (48), desired sample sizes, and Air Force approved sample sizes (58) are described in Table 10. Figure 2 gives the formula used in computing the desired maximum sample size necessary to achieve a confidence level of .95 $\pm$ .05 for the finite population. However, the Air Force Manpower and Personnel Center approved a lesser .90 confidence level and the sample populations at Table 10 based on a .60 expected return rate.

Table 10. Stratified Random Survey Sample

Grade	Population	Desired Sample	Approved Sample
Colonel	5,310	271	130
Lt Colonel	11,974	612	132
Major	17,955	917	112

$$n = \frac{N(z*z) * p(1-p)}{(N-1) * (d*d) + (z*z) * p(1-p)}$$

Where: n = sample size
N = population size
p = maximum sample size factor (.50)
d = desired tolerance (.05)
z = factor of assurance (1.96) for a 95 percent confidence level
* = multiplication function
+ = addition function

Figure 2. Formula for Computing Desired Sample Population (38:11-14)

Data Collection

Once the population of interest was defined, a cover letter (Appendix D), questionnaire (with control number)(Appendix A), answer sheet (AFIT Form 11D), and return envelope were sent to each participant.

Data Analysis

Upon receipt of the completed questionnaires, each questionnaire was hand scored and placed in a data file for analysis. The "Statistix II" interactive statistical analysis program for microcomputers was used to analyze the data (105). The data analysis techniques in Table 11 were used in the analysis process.

Table 11. Data Analysis Techniques

Research Questions	Data Analysis Techniques
1. What are the percentages of left-, right-, and integrated-brain dominant management styles of Air Force field grade officers by demographic categories (i.e., in general; by grade, gender, ethnic background, management level, and early promotion profile [below-the-zone promotion])?	Frequency Distribution One Way ANOVA Kruskal-Wallis ANOVA Pooled t-test Wilcoxon Rank Sum Test
a. Are there statistically significant differences in right-brain dominant management styles by demographic categories?	
b. Are there statistically significant differences in integrated-brain dominant management styles by demographic categories?	
2. In relation to potential ability,	Frequency Distribution One Way ANOVA Kruskal-Wallis ANOVA Pooled t-test Wilcoxon Rank Sum Test
a. What is the percentage of thinking potential ability Air Force field grade officers in general?	
b. What are the percentages of intuitive potential ability Air Force field grade officers by demographic categories (i.e., in general; by grade, gender, ethnic background, management level, and early promotion profile [below-the-zone promotion])? Are there statistically significant differences in intuitive potential abilities by demographic categories?	

Table 11. Data Analysis Techniques
(Continued)

Research Questions	Data Analysis Techniques
3. What are the percentages of management type Air Force field grade officers by demographic categories (i.e., in general; by grade, gender, ethnic background, management level, and early promotion profile [below-the-zone promotion])? Are there statistically significant dependencies in intuitive-potential-based management types (i.e., left/intuitive, right/in-tuitive, integrated/intuitive) by demographic categories.	Frequency Distribution Chi Square Test of Independence Pearson Two-by-Two Chi Square Test
4. Is there a statistically significant relationship between right-brain dominant management style and intuitive potential ability?	Pearson Product Moment r Correlation
5. Is there a statistically significant relationship between integrated-brain dominate management style and intuitive potential ability?	Pearson Product Moment r Correlation
6. Which Air Force field grade officers, in terms of brain dominant management styles and potential ability profiles, most like their occupation and feel it is right for them?	Frequency Distribution Chi Square Test of Independence Pearson Two-by-Two Chi Square
a. Is there statistically significant dependency between brain dominant management style and occupational satisfaction?	
b. Is there statistically significant dependency between potential ability profile and occupational satisfaction?	

Table 11. Data Analysis Techniques (Continued)

Research Questions	Data Analysis Techniques
c. Is there statistically significant dependency between Air Force Specialty Codes (AFSC) and occupational satisfaction?	
7. Are there statistically significant relationships between the first four steps of the "Five Steps of Problem Solving," as used in the field survey (Appendix A), and brain dominant management styles?	Frequency Distribution Chi Square Test of Independence
8. Do the field grade officers with right- and integrated-brain dominant management styles perceive themselves as intuitive?	Frequency Distribution Chi Square Test of Independence
9. Do the field grade officers with potential intuitive ability profiles perceive themselves as intuitive?	Frequency Distribution Pearson Two-by-Two Chi Square Test
10. What is the opinion of the value of intuition in the decisionmaking process of those surveyed? Is there statistically significant dependency between opinion and management level?	Frequency Distribution Chi Square Test of Independence

Statistical Analysis Particulars

Level of Significance. All statistical tests were performed at alpha of .10, per the Air Force Manpower and Personnel Center direction (58).

Parametric Versus Nonparametric Tests. Initially, nonparametric testing was conducted, when appropriate

(46:350-373). When P values approached .2500 or less (research alpha was .10), testing for parametric assumptions was conducted. If all assumptions were satisfied, parametric testing commenced (107:170-207,401-426). This procedure allowed expeditious testing of multiple demographic variables, without the repeated time-consuming testing of parametric assumptions. The switch to more powerful parametric testing (when assumptions were met) gave more valuable statistical findings when the test results was $\leq$ .10 (the research alph)(46:358).

Test of Assumptions.

Random and Independent Samples. This consideration was satisfied by use of a computerized selection algorithm, as previously detailed.

Normal Distribution of Sample Populations. Where normality is required for parametric testing, the Shapiro-Wilk Test for Normality was performed. When failed, a nonparametric alternative was utilized.

Homogeneity of Sample Population Variances. Where equal variances are required for parametric testing, the Barlett's Test for Equal Variances was performed. When failed, a nonparametric alternative was utilized.

Two Sample Population Means. Parametric testing of two sample population means was done by use of the Pooled t-test. A combined sample size of $n1 + n2 \geq 30$ was considered sufficient (107:174). Nonparametric testing

utilized the Wilcoxon Rank Sum Test. For n1 and n2 $\leq$ 10, the P-value was utilized for test determination. For n1 and n2 $\geq$ 10, both a Z-score and P-value were utilized (107:184; 92:738-739).

Analysis of Variance (ANOVA). Parametric testing of more than two sample means was done by use of the One Way ANOVA. Nonparametric testing utilized the Kruskal-Wallis One Way ANOVA.

Correlation. The Pearson Product Moment Coefficient of Correlation r was used as a measure of the strength of linear relationships.

Test of Independence/Dependence. The Chi Square Test of Independence was used to determine if the outcome of one variable was affected by or affected the outcome of another variable (107:253). Since this test becomes unreliable when several expected cell values are near zero, the Snedecor and Cockran general rules were followed: 1) No expected values < 1; 2) If most of the values are $\geq$ 5, two expected values may approach 1; classes with expected values < 1 may be combined to meet the requirements in 1) and 2) above (134:77). Test for two-by-two tables utilized the special Pearson Chi Square Test.

Criterion Test

The information gathered from the data analysis was used to determine the following concerning the officers

tested: the predominate brain-hemisphere preference (left-brain, right-brain, or integrated-brain); the predominate mental potential (intuitive or thinking); and the predominate management type (left-brain/thinking; right-brain/thinking; integrated-brain/thinking; left-brain/intuitive; right-brain/intuitive; or integrated-brain/intuitive). Those determinations, when coupled with the results of the opinion-based questions, preference-based questions, and demographic relationships, resulted in the determination of the extent of intuition as well as a characterization of the role of intuition in the decisionmaking process of Air Force field grade officers.

As with Agor (4), the preponderance of evidence was the criterion test which was used to determine both the extent of and the role of intuition in decisionmaking. Based predominately on frequency distribution, the criterion test received additional support from the findings of statistically significant relationships between variables of interest. The answers to research questions 1-5 resulted in a relative characterization of logical and rational versus intuitive cognitive predispositions among the subjects surveyed. Moreover, the answers to the remaining research questions resulted in a specific categorization of the perceived role of intution per se in the decisionmaking processes of the subjects surveyed.

Summary

This chapter overviewed the research design. It covered questions dealing with the test hypothesis, research design, research instrument, data analysis particulars, and others.

The next chapter presents the data analysis and addresses each research question in turn. The data analysis is then following by a comparison of the results of this research with that done by Weston Agor (4).

IV. Data Analysis

Introduction

The intent of this research was to examine the role of intuition in the decisionmaking processes of United States Air Force field grade officers. This chapter, which consists of an analysis of the results of the "Evaluation of Management Style and Potential Management Style" questionnaire (Appendix A), comprises the research results. It is organized in direct relation to the ten research questions presented in Chapter III (Table 11).

Research Hypothesis. The research hypothesis for this study was that United States Air Force field grade officers characteristically use analytical, logical, and rational thinking in their decisionmaking processes.

Sample Population. Table 12 details the sample population. Tables 14 through 44 and Appendices E through G give further delineation by demographic characteristics.

Table 12. Return Rate by Sample Population Grade

Grade	No. Solicited	No. of Respondents	Return Rate
Colonel	130	107	82%
Lt Colonel	132	111	84%
Major	112	86	77%
TOTAL	374	304	81.3%

Level of Testing. All statistical tests were performed at alpha of .10, per Air Force Manpower and Personnel Center direction (58).

Determining Management Style, Potential, and Type.

Management Style. Management style, presumed as that style actually practiced or perceived to be practiced on the job (4:16) (i.e., left-brain, right-brain, or integrated-brain), was determined by the respondents answers to the first fifteen questions on the survey tool (Appendix A). Scores ranged from a minimum of zero to a maximum of fifteen on each of the three brain dominant styles.

The left brain is the left half of the front section (forebrain) of the human brain which, in most people, processes information analytically, logically, and rationally (4; 61). The right-brain is the right half of the front section (forebrain) of the human brain which, in most people, processes information intuitively, holistically, and imagistically. The integrated-brain is the term used to designate relatively equal access to both sides of the brain and both styles of processing information. It employs the right- and left-hemispheres of the brain interchangeably, as the situation demands, and the use of the term implies a balance of analytical and intuitive thinking skills (4).

Potential Ability. Potential ability (thinking or intuition) was determined from the respondents' answers to questions 16-27, the minimum score being zero and the maximum score being 12.

By recapitulation, potential thinking ability is the underlying ability or preference to base decisions on known facts and information (4). Correspondingly, potential intuition is the underlying ability or preference to base decisions on intuition (4).

Management Type. The respondents' management types were determined as a compilation of management style and potential ability (e.g., left-brain management style and thinking potential resulted in a management type of "LT," left-brain/thinking.

Indeterminate Styles/Types. Those officers with tie scores in any of the profiled areas were designated as "indeterminate." According to Agor, such persons "have difficulty deciding which cues to listen to and act on" (4:20). In the balance of this chapter, the reader will note that indeterminates are ignored, as they were in Agor's study (4:20,22-33).

Research Results

Overview of Significant Findings. Table 13 details the statistically significant findings outlined in the subsequent discussion. Titles of tables and appendices with

Table 13. Summary of Statistically Significant Findings

Research Question Subject	Ref Table	P Value	Level of Significance P<.1	P<.05	P<.01	P<.001
1b. Joint sample integrated-brain dominant management style officers by ethnic background						
Measurement: Comparison of Means						
Significant Variables: Ethnic 1 (American Indian/Alaskan Native) and Ethnic 2 (Latin American, Puerto Rican, Cuban, other Hispanic)	18	.0887	X			
1b. Joint sample integrated-brain dominant management style officers selected at least once below-the-zone promotion						
Measurement: Comparison of Means						
Significant Variables: Col to Maj	20	.0428		X		
1b. Colonel integrated-brain dominant management style officers selected at least once below-the-zone promotion						
Measurement: Comparison of Means						
Significant Variables: Col & Maj	E.5	.0495		X		

Table 13. Summary of Statistically Significant Findings

Research Question Subject	Ref Table	P Value	Level of Significance P<.1	P<.05	P<.01	P<.001
1b. Joint sample integrated-brain dominant management style officers by ethnic background						
Measurement: Comparison of Means						
Significant Variables: Ethnic 1 (American Indian/Alaskan Native) and Ethnic 2 (Latin American, Puerto Rican, Cuban, other Hispanic)	18	.0887	X			
1b. Joint sample integrated-brain dominant management style officers selected at least once below-the-zone promotion						
Measurement: Comparison of Means						
Significant Variables: Col to Maj	20	.0428		X		
1b. Colonel integrated-brain dominant management style officers selected at least once below-the-zone promotion						
Measurement: Comparison of Means						
Significant Variables: Col & Maj	E.5	.0495		X		

Table 13. Summary of Statistically Significant Findings (Continued)

Research Question Subject	Ref Table	P Value	Level of Significance P<.1	P<.05	P<.01	P<.001
7. Joint sample relationship of the fourth step of problem solving to brain dominant management styles (i.e., Step 4: "Select a Solution")						
Measurement: Test of Independence						
Significant Variables: Brain Dominance and "Best, Worst, Most, Least"	37	.0000				X
8. Joint sample perception that one's personal decisionmaking uses intuition/ characterized as intuitive, by brain dominant management style						
Measurement: Test of Independence						
Significant Variables: Brain Dominance and "Most/Some/None of the Time"	39	.0998	X			
8. Joint sample perception that one is intuitive by nature, by brain dominant management style						
Measurement: Test of Independence						
Significant Variables: Brain dominance and "Yes/No"	40	.0001				X

Table 13. Summary of Statistically Significant Findings (Continued)

Research Question Subject	Ref Table	P Value	Level of Significance P<.1	P<.05	P<.01	P<.001
9. Joint sample perception that one's personal decisionmaking uses intuition/characterized as intuitive by potential ability						
Measurement: Test of Independence						
Significant Variables: Potential ability and "Most/Some/None of the Time"	41	.0000				X
9. Joint sample perception that one is intuitive by nature, by potential ability						
Measurement: Test of Independence						
Significant Variables: Potential ability and "Yes/No"	42	.0000				X
10. Joint sample opinion of the value of intuition, by management levels						
Measurement: Test of Independence						
Significant Variables: Management levels compared to scale of "Is Invaluable" to "Has Virtually no Value at All"	44	.0001				X

the word "Joint" refer to a non-stratified sample including colonels, lieutenant colonels, and majors, whereas "Colonel," "Lieutenant Colonel" or "Major" in the title designates those respective stratified samples.

Research Question No. 1. What are the percentages of left-, right-, and integrated-brain dominant management styles of Air Force field grade officers by demographic categories (i.e., in general, by grade, gender, ethnic background, management level, and early promotion profile [below-the-zone promotion])?

Table 14 presents a general overview of the total survey population in terms of numbers and percents by demographic categories. Tables 15 through 21 give details with percentages of each demographic category of interest.

Table 14. Joint Sample by Grade, Gender, Ethnic Background, Management Level, and Below-the-Zone Promotion Selection (N=304)

Category	N	Percent of Sample
Grade (N=304; 100%)		
Colonel	107	35
Lieutenant Colonel	111	37
Major	86	28
Gender (N=304; 100%)		
Male	285	94
Female	19	6

Table 14. Joint Sample by Grade, Gender, Ethnic Background, Management Level, and Below-the-Zone Promotion Selection (N=304) (Continued)

Category	N	Percent of Sample
Ethnic Background (N=304; 100%)		
American Indian/Alaskan Native	4	1
Black Non-Hispanic	2	<1
Filipino	1	<1
Latin American, Puerto Rican, Cuban, Other Hispanic	2	<1
White, Non-Hispanic, Caucasian, European, Middle Eastern, North African	295	97
Management Level* (N=304; 100%)		
Level 3	161	53
Level 2	58	19
Level 1	85	28
Below-the-Zone (BTZ) Promotion Selection (N=67; 22%)		
To Colonel	16	5
To Lieutenant Colonel	28	9
To Major	23	8
To 3 Grades	1	<1
To 2 Grades	13	4
To 1 Grade	53	17

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Appendices E.1 through E.5, F.1 through F.5, and G.1 through G.5 give grade stratified percentages and details by demographic categories of interest.

Of specific note is the fact that the data revealed that 46% of the population in general was left-brain dominant, 3% right-brain dominant, and 42% integrated-brain dominant (Table 15). Nine percent were designated as "indeterminate" because of tie scores.

Table 15. Joint Sample Brain Dominant Management Styles (In General)(N=304)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left	46	140	8.46	1.59
Right	3	9	6.78	0.97
Integrated	42	128	8.33	1.55
Indeterminate	9	27	N/A	N/A

Research Question No. 1a. Are there statistically significant differences in right-brain dominant management styles by demographic categories?

Grade. The joint sample population revealed the following right-brain dominant officers: 5 colonels, 2 lieutenant colonels, and 2 majors. Their mean scores were 6.60, 7.00 and 7.00 respectively. A comparison of means (Table 16) revealed no statistically significant difference. Of note were the consistently low scores

received across each grade as compared to the total possible score of 15. Moreover, the maximum score received by any right-brain dominant officer was 8. The median scores were 6, 7, and 7 respectively.

Table 16. Joint Sample Brain Dominant Management Styles (By Grade)(N=304)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=140; 46%)				
Colonel	16	50	8.42	1.61
Lt Colonel	18	55	8.76	1.70
Major	12	35	8.06	1.31
Right (N=9; 3%)				
Colonel	2	5	6.60	0.89
Lt Colonel	<1	2	7.00	1.40
Major	<1	2	7.00	1.40
Integrated (N=128; 42%)				
Colonel	14	43	8.20	1.70
Lt Colonel	14	42	8.30	1.40
Major	14	43	8.40	1.60
Indeterminate	9	27	N/A	N/A

Statistical tests:

1. Comparison of means; right-brain; Kruskal-Wallis ANOVA, KW .30, df 2, P .8607; no statistically significant difference.

2. Comparison of means; integrated-brain; Kruskal-Wallis ANOVA, KW .8412, df 2, P .6566; no statistically significant difference.

Gender. All right-brain dominant officers in the joint sample population were male (Table 17), their mean score being 6.78.

Table 17. Joint Sample Brain Dominant Management Styles (By Gender)(N=304)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=140; 46%)				
Male	44	135	8.47	1.61
Female	2	5	8.20	1.10
Right (N=9; 3%)				
Male	3	9	6.78	0.97
Female	0	0	N/A	N/A
Integrated (N=128; 42%)				
Male	38	115	8.40	1.58
Female	4	13	7.80	1.17
Indeterminate	9	27	N/A	N/A

Statistical tests:

1. Comparison of means; right-brain; insufficient data points.

2. Comparison of means; integrated-brain; Pooled t-test (2-tail), t 1.38, df 126, P .1668; no statistically significant difference.

Ethnic Background. All right-brain dominant officers in the joint sample population were of the following single ethnic category: White, Non-hispanic, Caucasian, European, Middle Eastern, North African. Their mean score was 6.78 (Table 18).

Table 18. Joint Sample Brain Dominant Management Styles (By Ethnic Background)(N=304)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=140; 46%)				
American Indian, Alaskan Native	0	0	N/A	N/A
Black Non-hispanic	<1	1	7.00	N/A
Filipino	<1	2	10.00	4.24
Latin American, Puerto Rican, Cuban, other Hispanic	0	0	N/A	N/A
White, Non-hispanic, Caucasian European, Middle Eastern, North African	45	137	8.45	1.60
Right (N=9; 3%)				
American Indian, Alaskan Native	0	0	N/A	N/A
Black Non-hispanic	0	0	N/A	N/A
Filipino	0	0	N/A	N/A
Latin American, Puerto Rican, Cuban, other Hispanic	0	0	N/A	N/A
White, Non-hispanic, Caucasian European, Middle Eastern, North African	3	9	6.78	0.97
Integrated (N=128; 42%)				
American Indian, Alaskan Native	<1	3	7.00**	1.00
Black Non-hispanic	0	0	N/A	N/A
Filipino	0	0	N/A	N/A
Latin American, Puerto Rican, Cuban, other Hispanic	<1	2	9.50**	2.12
White, Non-hispanic, Caucasian European, Middle Eastern, North African	41	123	8.34	1.50
Indeterminate	9	27	N/A	N/A

Statistical Test: Comparison of means; integrated-brain; One Way ANOVA, F 2.71, df 2, P .0887; statistically significant difference exists.

*P<.1
**P<.05
***P<.01
****P<.001

Management Level. There were 3 right-brain dominant officers in each of the 3 management levels (Table 19). The mean scores from level 3 through level 1 were 7.00, 6.67, 6.67 respectively. A comparison of means of the joint sample population revealed no statistically significant difference. There were insufficient data points to perform statistically tests for the stratified populations (Tables E.4, F.4, G.4). The mean scores for each level of management were consistently below the mean scores of corresponding left-brain and integrated-brain dominated management styles.

Table 19. Joint Sample Brain Dominant Management Styles (By Management Level*)(N=304)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=140; 46%)				
Level 3	26	78	8.42	1.47
Level 2	8	23	8.35	1.67
Level 1	13	39	8.62	1.79
Right (N=9; 3%)				
Level 3	<1	3	7.00	1.00
Level 2	<1	3	6.67	1.16
Level 1	<1	3	6.67	1.16
Integrated (N=128; 42%)				
Level 3	27	69	8.23	1.63
Level 2	8	25	8.64	1.29
Level 1	11	34	8.30	1.57
Indeterminate	9	27	N/A	N/A

Table 19. Joint Sample Brain Dominant Management Styles (By Management Level*)(N=304) (Continued)

Statistical Tests:

1. Comparison of means; right-brain; Kruskal-Wallis ANOVA, KW .3333, df 2, P .8465; no statistically significant difference.

2. Comparison of means; integrated-brain; One Way ANOVA, F .65, df 2 , P.5311; no statistically significant difference.

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Below-the-Zone (BTZ) Promotion. Only 1 officer of the 67 selected for early promotion profiled as right-brain dominant. His score was 8.00 out of 15 (Table 20); his BTZ grade was major.

Table 20. Joint Sample Brain Dominant Management Styles (By Below-the-Zone Promotion Selection)(N=67)

Brain Dominance	Percent of Selectees	N	Mean	Std Dv
Left (N=31; 46%)				
To Col	12	8	8.88	1.36
To Ltc	15	10	9.00	2.00
To Maj	19	13	8.92	2.14
Right (N=1; 2%)				
To Col	0	0	N/A	N/A
To Ltc	0	0	N/A	N/A
To Maj	2	1	8.00	N/A
Integrated (N=30; 45%)				
To Col	11	7	7.57**	1.62
To Ltc	25	17	8.47	1.51
To Maj	9	6	9.50**	1.38
Indeterminate	8	5	N/A	N/A

Statistical Tests:

1. Comparison of means, right-brain; insufficient data points.

2. Comparison of means; integrated-brain; One Way ANOVA, F 2.64, df 2, P .0897; statistically significant difference exists.

*P<.1
**P<.05
***P<.01
****P<.001

Research Question No. 1b. Are there statistically significant differences in integrated-brain dominant management styles by demographic categories?

Grade. The joint sample population revealed that the numbers of integrated-brain dominant officers were

virtually the same for each grade: 43 colonels, 42 lieutenant colonels, and 43 majors (Table 16). Their mean scores were 8.20, 8.30 and 8.40 respectively. A comparison of means revealed no statistically significant difference.

Gender. For the joint sample population, there were 115 males and 13 females that profiled with integrated-brain dominant management styles (Table 17). The mean scores were 8.40 and 7.80 respectively. A comparison of means revealed no statistically significant difference. When the population was stratified by grade, the stratified mean scores were higher for males in each grade except lieutenant colonel, where the reverse was true. However, no statistically significant difference was found concerning those means (Tables E.3, F.3, G.3).

Ethnic Background. There were three ethnic groups represented in the integrated-brain dominant management style category (Table 18). They were 1) American Indian/Alaskan Native; 2) Latin American, Puerto Rican, Cuban, other Hispanic; and 3) White, Non-Hispanic, Caucasian, European, Middle Eastern, North African. The number of officers scoring with this profile were 3, 2 and 123 respectively, with corresponding mean scores of 7.00, 9.50 and 8.34. A comparison of means revealed that a statistically significant difference exists between groups 1 and 2, as designated above. A stratified analysis revealed insufficient data points for statistical testing of means.

Management Level. The mean scores from level 3 through level 1 were 8.23, 8.64, 8.30 respectively (Table 19). A comparison of means of the joint sample population revealed no statistically significant difference. Additionally, as stratified by grade, a comparison of means also revealed no statistically significant difference (Tables E.4, F.4, G.4).

Below-the-Zone (BTZ) Promotion. Of the 67 officers selected for promotion below-the-zone (BTZ) for at least one grade, 30 officers profiled as integrated-brain dominant and 31 profiled as left-brain dominant (Table 20). This is in comparison to 1 right-brain dominant officer, and 5 indeterminates.

The mean scores by grade of below-the-zone selection (colonel through major) for the joint sample population were 7.57, 8.47, and 9.50. The mean scores consistently decreased as the grade of selection increased. When stratified by grade, colonels selected to one or more of the grades in question showed this identical pattern (colonel through major: 7.80, 8.14, and 11.00 respectively) (Table E.5). Lieutenant colonels and majors were selected BTZ to only their current grade.

A comparison of the joint sample mean scores revealed that a statistically significant difference exists between the mean scores of colonels and majors. Similarly, a comparison of mean scores by stratified grades revealed

statistically significant difference of means for officers currently ranked as colonels who were selected for below-the-zone promotion to colonel and/or major (Table E.5). No integrated-brain dominant lieutenant colonels were selected for early promotion to major. A comparison of means was not applicable for those currently holding the grade of major.

Further analysis in terms of multiple below-the-zone selections (Table 21) revealed that 1 officer was selected for early promotion to all three grade (integrated-brain score of 11), and 6 integrated-brain dominant officers were selected for 2 below-the-zone promotions. No right-brain dominant officers were selected more than once, whereas 6 left-brain dominant officers were selected twice for early

Table 21. Joint Sample Brain Dominant Management Styles (By Multiple Below-the-Zone Promotion Selections)(N=14)

Brain Dominance	Percent of Selectees	N	Mean	Std Dv
Three-Time Selectee (Col, Ltc, Maj)(N=1; 7%)				
Left	0	0	N/A	N/A
Right	0	0	N/A	N/A
Integrated	7	1	11.00	N/A
Two-Time Selectee (N=13; 93%)				
Col, Ltc (N=4; 29%)				
Left	7	1	8.00	N/A
Right	0	0	N/A	N/A
Integrated	21	3	8.67	2.08

Table 21. Joint Sample Brain Dominant Management Styles (By Multiple Below-the-Zone Promotion Selections)(N=14) (Continued)

Brain Dominance	Percent of Selectees	N	Mean	Std Dv
Two-Time Selectee (N=13; 97%)				
Col, Maj (N=3; 21%)				
Left	14	2	9.50	2.12
Right	0	0	N/A	N/A
Integrated	7	1	11.00	N/A
Ltc, Maj (N=5; 36%)				
Left	21	3	10.67	3.22
Right	0	0	N/A	N/A
Integrated	14	2	10.00	1.41
Indeterminate	7	1	N/A	N/A

Statistical Test: Comparison of means of two-time selectees, integrated; Kruskal-Wallis, KW .4108, df 2, P.8143; no statistically significant difference.

promotion. A comparison of means of integrated brain dominant, two-time selectees revealed no statistically significant difference.

Research Question No. 2.

Research Question No. 2a. In relation to potential ability, what is the percentage of thinking potential ability Air Force field grade officers in general?

Table 22 presents a general overview of the joint sample population in terms of potential abilities. It shows the sample population contains 194 (64%) officers with thinking potential and 83 (27%) with intuitive potential. A

remaining 27 (9%) are indeterminate because of tie scores. Tables 23 through 28 give details with percentages of each demographic category of interest. Tables E.6, E.7, F.6, F.7, G.6, and G.7 give related grade stratified details.

Table 22. Joint Sample Potential Abilities (In General)(N=304)

Potential Ability	Percent of Sample	N	Mean	Std Dv
Thinking	64	194	9.56	1.67
Intuition	27	83	9.25	1.81
Indeterminate	9	27	N/A	N/A

Research Question No. 2b. In relation to potential ability, what are the percentages of intuitive potential ability Air Force field grade officers by demographic categories (i.e., in general; by grade, gender, ethnic background, management level, and early promotion profile [below-the-zone promotion])? Are there statistically significant differences in intuitive potential abilities by demographic category?

The general characterization of intuitive potential ability is described above and is tabulated in Table 22. Concerning intuitive potential abilities by demographic categories, data analysis revealed the following:

Grade. From colonel through major, the numbers of potential intuitive officers were 32, 23 and 28

respectively, with respective mean scores of 9.31, 9.13, and 9.29 (Table 23). A comparison of means revealed that there was no statistically significant difference.

Table 23. Joint Sample Potential Abilities (By Grade)(N=304)

Potential Ability	Percent of Sample	N	Mean	Std Dv
Thinking (N=194; 64%)				
Colonel	22	66	9.64	1.65
Lt Colonel	27	81	9.48	1.65
Major	16	47	9.57	1.74
Intuition (N=83; 27%)				
Colonel	11	32	9.31	1.93
Lt Colonel	8	23	9.13	1.69
Major	9	28	9.29	1.80
Indeterminate	9	27	N/A	N/A

Statistical Test: Comparison of means; intuition; Kruskal-Wallis, KW .1469, df 2, P .9292; no statistically significant difference.

Gender. Of the 83 officers profiled as having potential intuitive ability, 75 were male and 8 were female with mean scores of 9.35 and 8.38 respectively (Table 24). A comparison of means revealed no statistically significant difference. Moreover, as examined in grade stratified samples, none showed any statistically significant difference in means scores.

Table 24. Joint Sample Potential Abilities (By Gender)(N=304)

Potential Ability	Percent of Sample	N	Mean	Std Dv
Thinking (N=194; 64%)				
Male	61	184	9.55	1.67
Female	3	10	9.60	1.71
Intuition (N=83; 27%)				
Male	25	75	9.35	1.81
Female	3	8	8.38	1.69
Indeterminate	9	27	N/A	N/A

Statistical Test: Comparison of means; intuition; Pooled t-test (2-tail), t 1.46, df 81, P .1453; no statistically significant difference.

Ethnic Background. The ethnic sample population was divisible into three groups: 1) American Indian/Alaskan Native--2 officers; 2) Latin American, Puerto Rican, Cuban, other Hispanic--1 officer; and 3) White, Non-Hispanic, Caucasian, European, Middle Eastern, North African--80 officers (Table 25). All members of these three groups were majors. A comparison of means for groups 1 and 3 (9.50 and 9.28 respectively) revealed no statistically significant difference; group 2, with only one data item, was not testable.

Table 25. Joint Sample Potential Ability
(By Ethnic Background)(N=304)

Potential Ability	Percent of Sample	N	Mean	Std Dv
Thinking (N=194; 64%)				
American Indian, Alaskan Native	<1	1	10.00	N/A
Black Non-hispanic	<1	1	9.00	N/A
Filipino	<1	1	12.00	N/A
Latin American, Puerto Rican, Cuban, other Hispanic	<1	1	10.00	N/A
White, Non-hispanic, Caucasian European, Middle Eastern, North African	63	190	9.54	1.67
Intuition (N=83; 27%)				
American Indian, Alaskan Native	<1	2	9.50	2.12
Black Non-hispanic	0	0	N/A	N/A
Filipino	0	0	N/A	N/A
Latin American, Puerto Rican, Cuban, other Hispanic	<1	1	7.00	N/A
White, Non-hispanic, Caucasian European, Middle Eastern, North African	26	80	9.28	1.81
Indeterminate	8	9	N/A	N/A

Statistically test: Comparison of means; intuition; insufficient data points.

Management Level. A comparison by management level, as defined in Table 26, showed the following: level 3, 45 officers; level 2, 13 officers; and level 1, 25 officers. The mean scores were 9.13, 9.54, and 9.32 respectively. A comparison of means for the joint sample population revealed that no statistically significant difference exists. When stratified by grade, a comparison of means did reveal a statistically significant difference

for the grade of lieutenant colonel between levels 3 and 1 (Table F.6). That grade showed 3 officers at level 3 (mean 10.67), 5 officers at level 2 (mean 9.80), and 15 officers at level 1 (mean 8.60).

Table 26. Joint Sample Potential Abilities
(By Management Level*)(N=304)

Potential Ability	Percent of Sample	N	Mean	Std Dv
Thinking (N=194; 64%)				
Level 3	34	104	9.45	1.61
Level 2	13	40	9.88	1.56
Level 1	17	50	9.52	1.85
Intuition (N=83; 27%)				
Level 3	15	45	9.13	1.69
Level 2	4	13	9.54	2.18
Level 1	8	25	9.32	1.87
Indeterminate	9	27	N/A	N/A

Statistical Test: Comparison of means; intuition; Kruskal-Wallis ANOVA, KW .4463, df 2, P .8000; no statistically significant difference.

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Below-the-Zone (BTZ) Promotion Selection.

Potential intuitive ability scores by grade revealed 3 colonels (mean 9.33), 8 lieutenant colonels (mean 8.88), and 9 majors (mean 8.89) (Table 27). A comparison of means for the joint sample population showed no statistically significant difference, as also was the case for the stratified grades (Tables E.7, F.7, G.7). Potential intuition scores for multiple early promotion selectees for the joint population revealed an overall mean score of 9.40 (Table 28).

Table 27. Joint Sample Potential Abilities (By Below-the-Zone Promotion Selection)(N=67)

Potential Ability	Percent of Selectees	N	Mean	Std Dv
Thinking (N=39; 58%)				
To Col	19	13	8.85	1.77
To Ltc	22	15	9.80	1.52
To Maj	16	11	9.46	1.86
Intuition (N=20; 30%)				
To Col	5	3	9.33	2.08
To Ltc	12	8	8.88	1.46
To Maj	13	9	8.89	1.70
Indeterminate	12	8	N/A	N/A

Statistical Test: Comparison of means; Intuition; Kruskal-Wallis ANOVA, KW .2450, df 2, P .8847; no statistically significant difference.

Table 28. Joint Sample Potential Abilities
(By Multiple Below-the-Zone Promotion Selections)(N=14)

Potential	Percent of Selectees	N	Mean	Std Dv
Three-Time Selectee (Col, Ltc, Maj) (N=1; 7%)				
Thinking	0	0	N/A	N/A
Intuition	7	1	11.00	N/A
Two-Time Selectee Selectee (N=13; 93%)				
Col, Ltc (N=4; 29%)				
Thinking	21	3	9.00	1.00
Intuition	7	1	10.00	N/A
Col, Maj N=3; 21%)				
Thinking	14	2	7.00	N/A
Intuition	7	1	10.00	N/A
Ltc, Maj (N=5; 36%)				
Thinking	14	2	7.00	N/A
Intuition	21	3	9.00	1.73
Indeterminate	7	1	N/A	N/A

Statistical Test: Insufficient data points

Research Question No 3. What are the percentages of management type Air Force field grade officers by demographic categories (i.e., in general; by grade, gender, ethnic background, management level, and early promotion profile [below-the-zone promotion])? Are there statistically significant dependencies in intuitive-potential-based management types (i.e., left/intuitive, right/intuitive and integrated/intuitive) by demographic categories?

The number of management type officers for left/intuitive, right/intuitive, and integrated/intuitive were 24, 7, and 46, respectively, a total of 25 percent of the joint sample population. Table 29 presents a general overview of the joint sample population in terms management type. Tables 30 through 34 give details with percentages of each demographic category of interest. Grade stratified demographics were insignificant and are not therefore included.

Table 29. Joint Sample Management Type (In General)(N=304)

	LT	LI	RT	RI	IT	II	ID	TOTAL
Number	99	24	3	7	75	46	50	304
Percent*	33	8	1	2	25	15	16	100

Note: A tie score among left-, right-, or integrated-brain, or thinking or intuition potential causes an indeterminate (ID) in Management Type.

*Percent by type for total population

Legend: Management Types

LT: Left-brain/Thinking
LI: Left-brain/Intuitive
RT: Right-brain/Thinking
RI: Right-brain/Intuitive
IT: Integrated-brain/Thinking
II: Integrated-brain/Intuitive
ID: Indeterminate

Concerning management types by demographic categories, data analysis revealed the following:

Grade. Table 30 gives the details of management type by grade for the joint sample population. A test of

independence revealed that no statistically significant dependency exits for grades and management types (i.e., left/intuitive, right/intuitive, and integrated intuitive).

Table 30. Joint Sample Management Type (By Grade)(N=304)

	LT	LI	RT	RI	IT	II	ID	TOTAL
Number								
Colonel	39	7	2	5	22	20	12	107
Lt Colonel	38	8	1	1	32	10	21	111
Major	22	9	0	1	21	16	17	86
TOTAL:	99	24	3	7	75	46	50	304
Percent*								
Colonel	13	2	<1	2	7	7	4	35
Lt Colonel	13	3	<1	<1	11	3	7	37
Major	7	3	0	<1	7	5	6	28
TOTAL:	32	8	1	2	25	15	17	100

Note: A tie score among left-, right-, or integrated-brain, or thinking or intuition potential causes an indeterminate (ID) in Management Type.

*Percent, by grade, for total sample population

Statistically Test: Chi Square Test of Independence, LI, RI, II; Chi Square 4.526, df 4, P .3394; no statistically significant dependence.

Legend: Management Types

LT: Left-brain/Thinking
LI: Left-brain/Intuitive
RT: Right-brain/Thinking
RI: Right-brain/Intuitive
IT: Integrated-brain/Thinking
II: Integrated-brain/Intuitive
ID: Indeterminate

Gender. Data points for the joint sample population were sufficient only for testing of gender versus left/intuitive and integrated/intuitive. A test of independence revealed no statistically significant dependency (Table 31). Testing by grade stratification revealed similar results.

Table 31. Joint Sample Management Type (By Gender)(N=304)

	LT	LI	RT	RI	IT	II	ID	TOTAL
Number								
Male	96	22	3	7	69	40	48	285
Female	3	2	0	0	6	6	2	19
TOTAL:	99	24	3	7	75	46	50	304
Percent*								
Male	32	7	1	2	23	13	16	94
Female	1	<1	0	0	2	2	<1	6
TOTAL:	33	8	1	2	25	15	16	100

Note: A tie score among left-, right-, or integrated-brain, or thinking or intuition potential causes an indeterminate (ID) in Management Type.

*Percent, by gender, for the total sample population

Statistically Test: Chi Square Test of Independence; LI, II; Chi Square .3457, df 1, P .5566; no statistically significant dependence.

Legend: Management Types

LT: Left-brain/Thinking
LI: Left-brain/Intuitive
RT: Right-brain/Thinking
RI: Right-brain/Intuitive
IT: Integrated-brain/Thinking
II: Integrated-brain/Intuitive
ID: Indeterminate

Ethnic Background. Table 32 gives the distribution of management type by ethnic background. There were insufficient data points to do any statistical test at the joint population or stratified levels.

Management Level. Table 33 gives the particulars on management type by management level. A test of independence revealed no statistically significant dependency. Testing by grade stratification revealed similar results.

Below-the-Zone (BTZ) Promotion Selection. Data points allowed a test of independence for grade versus left/intuitive and integrated/intuitive (Table 34). The test revealed no statistically significant dependency. Data points precluded testing of grade stratified samples.

Research Question No. 4. Is there a statistically significant relationship between right-brain dominant management style and intuitive potential ability?

A test of correlation for the total population, using the Pearson Product Moment Coefficient of Correlation r, revealed r = .4140 for 6 cases, showing moderate correlation. An examination of grade stratified samples revealed the following: colonel, r = .5222, 4 cases; lieutenant colonel, too few cases to correlate; major, too few cases to correlate.

Table 32. Joint Sample Management Type (By Ethnic Background)(N=304)

	LT	LI	RT	RI	IT	II	ID	TOTAL
Number								
American Indian, Alaskan Native	0	0	0	0	0	2	2	4
Black Non-hispanic	1	0	0	0	0	0	1	2
Filipino	1	0	0	0	0	0	0	1
Latin American, Puerto Rican, Cuban, other Hispanic	0	0	0	0	1	1	0	2
White, Non-hispanic, Caucasian, European, Middle Eastern, North African	97	24	3	7	74	43	47	295
TOTAL:	99	24	3	7	75	46	50	304
Percent of Total Population								
American Indian, Alaskan Native	0	0	0	0	0	<1	<1	1
Black Non-hispanic	<1	0	0	0	0	0	<1	<1
Filipino	<1	0	0	0	0	0	0	<1
Latin American, Puerto Rican, Cuban, other Hispanic	0	0	0	0	<1	<1	0	1
White, Non-hispanic, Caucasian, European, Middle Eastern, North African	32	8	1	2	24	14	16	97
TOTAL:	34	8	1	2	24	15	16	100

Statistical Test: Insufficient data points.

Legend: Management Types

LT: Left-brain/Thinking **RT:** Right-brain/Thinking **IT:** Integrated-brain/Thinking
LI: Left-brain/Intuitive **RI:** Right-brain/Thinking **II:** Integrated-brain/Intuitive
ID: Indeterminate

Table 33. Joint Sample Management Type
(By Management Level*)(N=304)

	LT	LI	RT	RI	IT	II	ID	TOTAL
Number								
Level 3	57	12	1	1	40	26	24	161
Level 2	15	5	1	2	17	6	12	58
Level 1	27	7	1	4	18	14	14	85
TOTAL:	99	24	3	7	75	46	50	304
Percent**								
Level 3	19	4	<1	<1	13	9	8	53
Level 2	5	2	<1	<1	6	2	4	19
Level 1	9	2	<1	1	6	5	5	28
TOTAL:	34	8	1	2	24	15	16	100

Note: A tie score among left-, right-, or integrated-brain, or thinking or intuition potential causes an indeterminate (ID) in Management Type.

**Percent, by management level, of total sample population

Statistical Test: Chi Square Test of Independence; LI, RI, II; Chi Square 4.784, df 4, P .3104; no statistically significant dependence.

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Legend: Management Types

LT: Left-brain/Thinking
LI: Left-brain/Intuitive
RT: Right-brain/Thinking
RI: Right-brain/Intuitive
IT: Integrated-brain/Thinking
II: Integrated-brain/Intuitive
ID: Indeterminate

Table 34. Joint Sample Management Type
(By Below-the-Zone Promotion Selection)(N=67)

	LT	LI	RT	RI	IT	II	ID	TOTAL
Number								
To Col	7	1	0	0	5	2	1	16
To Ltc	5	3	0	0	10	6	4	28
To Maj	9	2	0	1	1	5	5	23
TOTAL:	21	6	0	1	16	13	10	67
Percent of Selectees								
To Col	10	2	0	0	7	3	2	24
To Ltc	7	5	0	0	15	9	6	42
To Maj	13	3	0	2	2	7	7	34
TOTAL:	30	10	0	2	24	19	15	100

Note: A tie score among left-, right-, or integrated-brain, or thinking or intuition potential causes an indeterminate (ID) in Management Type.

Statistical Test: Chi Square Test of Independence; LI, II; Chi Square .464, df 2; P .9771; no statistically significant dependence.

Legend: Management Types

LT: Left-brain/Thinking
LI: Left-brain/Intuitive
RT: Right-brain/Thinking
RI: Right-brain/Intuitive
IT: Integrated-brain/Thinking
II: Integrated-brain/Intuitive
ID: Indeterminate

Research Question No. 5. Is there a statistically significant relationship between integrated-brain dominant management style and intuitive potential ability?

A test of correlation for the total population, using the Pearson Product Moment Coefficient of Correlation r, revealed r = -.0068 for 44 cases, showing overall minute negative correlation. However, a further examination of grade stratified samples revealed the following: colonel, r = -.1817, 18 cases; lieutenant colonel, r = -.0946, 10 cases; major, r = .3012, 16 cases, thereby indicating from major through colonel a possible diminishing correlation along a positive to negative continuum.

Research Question No. 6. Which Air Force field grade officers, in terms of brain dominant management styles and potential ability profiles, most like their occupation and feel it is right for them?

Brain Dominant Management Style. Both left-brain and integrated-brain dominant officers, based on the joint sample population, reported a higher satisfaction rate than did the right-brain dominant officers; to wit, left-brain 84% like, 16% dislike; integrated-brain 86% like, 14% dislike; right-brain 67% like, 33% dislike (Table 35).

By grade stratification, colonels reported a much stronger "like" statistic for left- and integrated-brain dominance and a relatively equally "like" statistic for right-brain dominance: i.e., left-brain dominance, 92% like, 8% dislike; integrated-brain dominance, 98% like, 2% dislike; right-brain dominance, 60% like, 40% dislike (Table E.8).

Lieutenant colonels reported a slightly lower "like" statistic for all three brain dominance profiles, with correspondingly higher dislike levels: i.e., Left-brain dominance 78% like, 22% dislike; integrated-brain dominance, 79% like, 21% dislike; right-brain dominance, 50% like, 50% dislike (right-brain limited to 2 officers)(Table F.8).

Table 35. Joint Sample Occupation Satisfaction (By Brain Dominant Management Style)(N=304)

Brain Dominance	Like Occupation Yes	No	AFSC's Responding No
Left (N=140; 46%)			
Number	118	22	0002, 0016, 1406, 1425, 1545, 1555 2225 (2x) 2245 (2x), 2716 (3x), 2816 4916 (2x), 4996, 6416, 6616 (2x), 7316 (2x)
Percent	84	16	
Right (N=9; 3%)			
Number	6	3	0026, 2716, 4096
Percent	67	33	
Integrated (N=128; 42%)			
Number	110	18	0002, 0026 (3x), 0726, 1455, 2225 (2x), 2245, 2295, 6011, 6516, 7046 (2x), 7416 8016, 9756 (2x)
Percent	86	14	

Table 35. Joint Occupation Satisfaction
(By Brain Dominant Management Style)(N=304)
(Continued)

Indeterminate: (N=27; 9%)

Statistical Tests:

1. Management Style and Satisfaction; Chi Square 2.389, df 2, P .3028; no statistically significant dependency exists.

2. AFSC and Satisfaction, Left Dominance; subset of AFSC's that responded "no" (each AFSC with a response "no" had at least one "yes"); Chi Square 20.65, df 21, P .6027; no statistically significant dependency exists.

3. AFSC and Satisfaction, Right Dominance; subset of AFSC's that responded "no" (each AFSC with a response "no" had at least one "yes"); Chi Square .3750, df 2, P .8290; no statistically significant dependency exists.

4. AFSC and Satisfaction, Integrated Dominance; subset of AFSC's that responded "no" (each AFSC with a response "no" had at least one "yes"); Chi Square 19.03, df 17, P .6203; no statistically significant dependency exists.

Major's reported similar satisfaction levels as follows: left-brain dominant, 83% like, 17% dislike; integrated-brain dominant, 81% like, 19% dislike; right-brain dominant, 100% like (limited to 2 officers) (Table G.8).

Potential Abilities. Both potential thinking and intuitive ability officers like their occupations equally; to wit, potentially thinking officers, 85% like, 15% dislike; potentially intuitive officers, 86% like, 14% dislike (Table 36).

Table 36. Joint Sample Occupation Satisfaction (By Potential Ability)(N=304)

Potential Ability	Like Occupation Yes	No	AFSC's Responding No
Thinking (N=194; 64%)			
Number	165	29	0002, 0016, 0026 (3x), 1406 1425, 1455, 1545, 1555, 2225 (2x) 2245, 2716 (4x), 4916 (3x), 4996 (2x), 6011 6416 (2x), 6616 (2x), 7046, 7316
Percent	85	15	
Intuition (N=83; 27%)			
Number	71	12	0002, 0026, 0726 2245, 2716, 4096 7046, 7416, 8016 (2x), 9756 (2x)
Percent	86	14	
Indeterminate (N=27; 9%)			

Statistical Tests:

1. Potential Ability and Satisfaction; Chi Square .0111, df 1, P .9161; no statistically significant dependency exists.

2. AFSC and Satisfaction, Thinking Potential; subset of AFSC's that responded "no" (each AFSC with a response "no" had at least one "yes"); Chi Square 23.14, df 28, P .4267; no statistically significant dependency exists.

3. AFSC and Satisfaction, Intuition Potential; subset of AFSC's that responded "no" (each AFSC with a response "no" had at least one "yes"); Chi Square 12.03, df 11, P .6489; no statistically significant dependency exists.

By grade stratification, colonels reported a stronger "like" statistic for both potential thinking ability and potential intuition ability: i.e., potential thinking, 91% like, 9% dislike; potential intuition, 94% like, 6% dislike (Table E.9).

Lieutenant colonels reported a slightly lower "like" statistic for both potential profiles, with correspondingly higher dislike levels: i.e., potential thinking 77% like, 23% dislike; potential intuition, 83% like, 17% dislike (Table F.9).

Major's reported similar satisfaction levels as follows: potential thinking, 87% like, 13% dislike; potential intuition, 79% like, 21% dislike (Table G.9).

Research Question 6a. Is there statistically significant dependency between brain dominant management style and occupational satisfaction?

A test of independence of the joint sample population revealed that there was no statistically significant dependency (P .3028) (Table 35). However, when tested as stratified grades, the grade of colonel revealed statistically significant dependency: i.e., P .0073, Left- and integrated-brain dominance both showing a much higher like ratio (46:4 and 42:1, respectively) (Table E.8).

Research Question 6b. Is there statistically significant dependency between potential ability profile and occupational satisfaction?

A test of independence of the joint sample population revealed that there was no statistically significant dependency (P .9161) (Table 36). When tested as stratified grades the joint results was duplicated (Tables E.9, F.9, G.9).

Research Question 6c. Is there statistically significant dependency between Air Force Specialty Codes (AFSC) and occupational satisfaction?

A test of independence of the joint sample population revealed that there was no statistically significant dependency (Table 35).

Research Question No. 7. Are there statistically significant relationships between the first four steps of the "Five Steps of Problem Solving," as used in the survey instrument (Appendix A), and brain dominant management styles?

The surveyed officers were asked to designate in which of the first four problem solving steps they perceived themselves as "Best" and "Worst," and in which steps they took the "Most" and "Least" time.

Data analysis was conducted for the joint population. Insufficient data points exist for stratified testing in any grade. Table 37 gives the particulars.

Step One, Identify the Problem. Officers of each category of brain dominance consistently picked "Perceived Best" as the designator most typically characterizing their

Table 37. Joint Sample Relationship of the First Four Steps of Problem Solving to Brain Dominant Management Styles (N=304)

Step One, Identify the Problem

Brain Dominance	Perceived Best	Perceived Worst	Spent Most Time	Spent Least Time
Left (N=140)	63 (45%)	19 (14%)	17 (12%)	38 (27%)
Right (N=9)	4 (44%)	2 (22%)	1 (11%)	4 (44%)
Integrated (N=128)	47 (37%)	28 (22%)	30 (23%)	31 (24%)

Statistical Test: Chi Square Test of Independence; Chi Square 9.089, df 6, P .1687; no statistically significant dependency exists.

Step Two, Determine Alternative Solutions

Brain Dominance	Perceived Best	Perceived Worst	Spent Most Time	Spent Least Time
Left (N=140)	23 (16%)	65 (46%)	37 (26%)	19 (14%)
Right (N=9)	3 (33%)	1 (11%)	1 (11%)	1 (11%)
Integrated (N=128)	29 (23%)	54 (42%)	36 (28%)	15 (12%)

Statistical Test: Chi Square Test of Independence; Chi Square 6.688, df 6, P .3507; no statistically significant dependency exists.

Notes: 1. Variation Due to Non-response.

2. Percent, as of brain dominance.

3. Indeterminate = 27

Table 37. Joint Sample Relationship of the First Four Steps of Problem Solving to Brain Dominant Management Styles (N=304) (Continued)

Step Three, Evaluate the Alternatives

Brain Dominance	Perceived Best	Perceived Worst	Spent Most Time	Spent Least Time
Left (N=140)	32 (23%)	24 (17%)	75 (54%)	5 (4%)
Right (N=9)	1 (11%)	4 (44%)	1 (11%)	2 (22%)
Integrated (N=128)	25 (20%)	31 (24%)	53 (41%)	11 (9%)

Statistical Test: Chi Square Test of Independence; Chi Square 11.08, df 6, P .0861; statistically significant dependency exists.

Step Four, Select a Solution

Brain Dominance	Perceived Best	Perceived Worst	Spent Most Time	Spent Least Time
Left (N=140)	22 (16%)	27 (19%)	10 (7%)	77 (55%)
Right (N=9)	1 (11%)	2 (22%)	6 (66%)	2 (22%)
Integrated (N=128)	27 (21%)	10 (8%)	9 (7%)	67 (52%)

Statistical Test: Chi Square Test of Independence; Chi Square 33.39, df 6, P .0000; statistically significant dependency exists.

Notes: 1. Variation Due to Non-response.

2. Percent, as of brain dominance.

3. Indeterminate = 27

Table 37. Joint Sample Relationship of the First Four Steps of Problem Solving to Brain Dominant Management Styles (N=304) (Continued)

Summary, Steps One Through Four

	Left-brain	Right-brain	Integrated-brain
Perceived Best	Identify Problem	Identify Problem	Identify Problem
Perceived Worst	Determine Alternative Solutions	Evaluate Alternatives	Determine Alternative Solutions
Spent Most Time	Evaluate Alternatives	Select Solution	Evaluate Alternatives
Spent Least Time	Select Solution	Identify Problem	Select Solution

overall relationship to this step. For "Perceived Best," left-, right-, and integrated-brain dominant officers were 45%, 44%, and 37% respectively. Right-brain officers stated that, overall, this step required the least amount of their time. A test of independence showed that no statistically significant dependency exists for this step and brain dominant management styles (P .1687).

Step Two, Determine Alternative Solutions. Both left- and integrated-brain dominant officers ranked this step as their overall "Perceived Worst," favoring "Worst" over "Best" by margins of 3:1 and 2:1 respectively. They also chose "Spent Most Time" over "Spent Least Time" by a margin of 2:1. Right-brain dominant officers ranked this step as "Best" over "Worst" by a margin of 3:1. No other

substantive patterns were apparent. No statistically significant dependency exists for this step and brain dominant management styles (P .3507).

Step Three, Evaluate the Alternatives. Statistically significant dependency does exists for this step and brain dominant management styles (P .0861). Whereas left- and integrated-brain dominant officers averaged only a 5 point percent spread between "Perceived Best" and "Perceived Worst" (23% to 17% and 20% to 24% respectively), the right-brain officers had a reverse 33 point percent spread (11% to 44%) and ranked this step as their overall "Perceived Worst," showing possibly greater difficulty in evaluating alternatives for right-brain dominant officers. However, both left- and integrated-brain dominant officers reported significantly greater time required in the evaluation of alternatives than did right-brain dominant officers, ranking this step as requiring the most overall time (i.e., ratio of "Most" to "Least," left: 14:1; integrated: 5:1, right 1:2).

Step Four, Select a Solution. Statistically significant dependency exists for this step and brain dominant management styles (P .0000). Integrated-brain dominant officers were reportedly 2.7 times as likely to be "Best" at this step than "Worst." Right-brain dominant officers were nearly the opposite--1 reported being "Best" at this step, whereas 2 reported being "Worst." Moreover,

66% of right-brain dominant officers designated this step as requiring the "Most" of their time (as opposed to 22% for "Least"), making it their overall choice for most time consumed, whereas both left- and integrated-brain dominant officers reported nearly the opposite for themselves ("Least," 55% and 52% respectively), making this step the one requiring the overall least amount of their time.

Research Question No. 8. Do the field grade officers with right- and integrated-brain dominant management styles perceive themselves as intuitive?

The officers surveyed were asked two separate questions to ascertain if they perceived themselves as intuitive (Appendix A, questions 29 and 30). The first question asked if they felt that their decisionmaking style used intuition and could be characterized as intuitive. Of the joint sample population, 290 (95%) answered either "Most of the time," or "Some of the time" (26% and 69% respectively). Only 14 (5%) reported "None of the time" (Table 38).

Table 38. Joint Sample Perception That One's Personal Decisionmaking Uses Intuition/Characterized as Intuitive (In General)(N=304)

Characterization	Response	Percent
Most of the Time	80	26
Some of the Time	210	69
None of the Time	14	5
TOTAL:	304	100

When examined by brain dominant management style (Table 39), it was noted that 100% of right-brain dominant officers answered in the aforementioned combined category (55% in the "Most of the time" category). Additionally, both left- and integrated-brain dominant officers favored "Some of the time" to "Most of the Time" at a ratio of 3:1. A test of independence showed that statistically significant dependency exits in this relationship of brain dominance and opinion.

Table 39. Joint Sample Perception That One's Personal Decisionmaking Uses Intuition/Characterized as Intuitive (By Brain Dominant Management Style)(N=304)

Brain Dominance	Most of the Time	Some of the Time	None of the Time
Left (N=140)	34	96	10
Right (N=9)	5	4	0
Integrated (N=128)	33	92	3
TOTAL:	72	192	13

Indeterminate: 27

Statistical Test: Chi Square Test of Independence; Dominance versus Most and Some of the Time; Chi Square 3.760, df 2, P .0998; statistically significant dependency exists.

The second question asked if the officers surveyed personally felt that they were intuitive persons by nature, without regard to how they may actually approach their decisionmaking responsibilities. Two hundred and one responded "yes" and 103 responded "no." When examine long

the lines of brain dominance, it was seen that the officers survey answered "Yes" in increasing proportion as they moved from left-, to right-, to integrated-brain dominance. Seventy eight (56%) left-brain dominant officers answered yes, as did 6 (67%) right-brain dominant officers, and 103 (81%) integrated-brain dominant officers. A test of independence showed that the relationship of brain dominance and opinion was statistically significant (P .0001) (Table 40).

Table 40. Joint Sample Perception That One is Intuitive by Nature (By Brain Dominant Management Style)(N=304)

Brain Dominance	Number Yes	Percent* Yes	Number No	Percent* No
Left (N=140, 46%)	78	56	62	44
Right (N=9; 3%)	6	67	3	33
Integrated (N=128, 42%)	103	81	25	19
TOTAL:	187	N/A	90	N/A

Indeterminate: 27

*Percent of brain dominance

Statistical Test: Management Style and Perception; Chi Square 18.68, df 2, P .0001; statistically significant dependency exists.

Research Question 9. Do the field grade officers with potential intuitive ability perceive themselves as intuitive?

The same survey questions used to answer research question number 8 were used for this research question. However, they were examined along the lines of potential abilities instead of management style.

When the first survey question (Appendix A, question 29) was examined by potential ability (Table 41), it was noted that 79 (95%) of potential intuitive officers responded in the compiled category which included "Most of the time" and "Some of the time" (30% and 65% respectively; ratio of 1:2). However, potential thinking ability officers favored "Some of the time" over "Most of the time" at a ratio of 3.5 to 1, similar to that of brain dominant management style in research question 8 above. Statistically significant dependency exists in the relationship of potential ability and opinion (P .0000).

Table 41. Joint Sample Perception That One's Personal Decisionmaking Uses Intuition/Characterized as Intuitive (By Potential Ability)(N=304)

Potential Ability	Most of the Time	Some of the Time	None of the Time
Thinking (N=194, 64%)	41	145	8
Intuitive (N=83, 27%)	25	54	4
TOTAL:	66	199	12
Indeterminate: 27			

Statistical Test: Perception and Potential Ability; Chi Square 64.87, df 2, P .0000; statistically significant dependency exists.

When the second survey question (i.e., perception of being intuitive by nature) was examined along the lines of potential ability (Table 42), it was seen that 62 (75%) of the potential intuitive officers answered "yes," as did 128 (66%) of the potential thinking officers. A test of independence revealed that a statistically significant dependency exists between potential ability (thinking/intuitive) and opinion (P .0000). This pattern of a higher percentage for potential intuitive ability as compared to potential thinking ability is similar to that found for brain dominance in research question 8 above.

Table 42. Joint Sample Perception That One is Intuitive by Nature (By Potential Ability)(N=304)

Potential Ability	Number Yes	Percent* Yes	Number No	Percent* No
Thinking (N=194, 64%)	128	66	66	34
Intuitive (N=83, 27%)	62	75	21	25
TOTAL:	190	N/A	87	N/A

Indeterminate: 27

*Percent of potential ability

Statistically Test: Potential Ability and Perception; Chi Square 186.7, df 1, P .0000; statistically significant dependency exists.

Research Question No. 10. What is the opinion of the value of intuition in the decisionmaking process of those

surveyed? Is there statistically significant dependency between opinion and management level?

Question 31 of the survey instrument (Appendix A) was used to answer this question. Two hundred and two (67%) of the respondents answered that intuition "is a very useful resource in solving problems." Additionally, 28 (9%) answered "is invaluable" for a total of 76% in these two categories. Fifty three (17%) stated that it has "average value," 21 (7%) that it has "limited value," and none said it has "virtually no value at all" (Table 43).

Table 43. Joint Sample Opinion of the Value of Intuition (In General)(N=304)

Opinion	Response	Percent*
Is Invaluable	28	9
Is a very useful resource in solving problems	202	67
Has average value	53	17
Has Limited Value	21	7
Has virtually no value at all	0	0
TOTAL:	304	100

*Percent of Sample

A test for dependency between management levels and opinion (excluding the zero response opinion) revealed that statistically significant dependency exists (P .0001) (Table 44). Management levels 3 and 1 were nearly equal to each other, except for opinion category 2: "Is very useful...,"

where management level 1 was nearly triple the value of level 3. Moreover, management level 3 and 1 were consistently higher in every opinion category than management level 2.

Table 44. Joint Sample Opinion of the Value of Intuition (By Management Level* (ML))(N=304)

Opinion	ML 3	ML 2	ML 1
Is Invaluable	13	4	11
Is a very useful resource in solving problems	45	39	118
Has average value	21	11	21
Has Limited Value	6	4	11
Has virtually no value at all	0	0	0
TOTAL:	85	58	161

Statistical Test: Opinion (levels 5-2) versus Management Levels (3-1); Chi Square 28.10, df 6, P .0001; statistically significant dependency exists.

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Research Results Compared to Agor

Introduction. Areas of similarity with this research were compared to Agor's findings (4). Because Agor's

published findings (4) did not reveal the specifics of his statistical methodology, only general comparisons could be made. Additionally, since no variances were provided with mean scores, and only limited sample sizes were labeled, no statistical comparisons of means between this research and Agor's research were possible.

The reader should note that the use of the acronym ASPA refers to Agor's national sample of members of the American Society of Public Administrators (ASPA).

Level of Management. Persons who participated in Agor's original survey designated their management level as "top, middle, or lower" (2:14). Those responding to this research effort designated their management level as 3, 2, or 1, as previously defined in various tables (compare Table 45). Because of the nondescript nature of Agor's management levels, only a general comparison can be drawn against the management levels of this research.

Potential Intuition. As depicted in Table 45., the Air Force mean scores for potential intuition (for all survey respondents and for all management levels) were consistently below each of Agor's samples. For management level 3, the Air Force joint sample mean averaged 1.53 below Agor's samples; for combined management levels 1 and 2, the Air Force joint sample mean averaged 1.2 below Agor's samples.

Table 45. Score on Potential Intuition Scale (By Management Level*) (2:23)

Management Level	Air Force Mean	Air Force N	Agor Private Sector	Agor ASPA Sample	Agor 3-State Sample
Level 3	4.8	161	6.3	6.5	6.2
Level 2	3.9	58	N/A	N/A	N/A
Level 1	4.7	85	N/A	N/A	N/A
Levels 2 & 1	4.5	143	N/A	5.8	5.6

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Combined Intuition and Integration. When the individual Air Force joint sample mean scores for potential intuition and integration were combined for an overall score (0 minimum; 27 maximum) and then compared to Agor's equivalent samples, it was noted that the Air Force mean was consistently below Agor's multiple sector samples. The Air Force joint mean score is 2.96 below the average of Agor's multiple sector mean scores for management level 3 and 1.13 below the average of Agor's multiple sector mean scores for combined levels 1 and 2 (Table 46).

Table 46. Combined Scores on Intuition/Integration (By Management Level*) (4:24)

Management Level	Air Force Mean	Air Force N	Agor Private Sector	Agor ASPA Sample	Agor 3-State Sample
Level 3	10.4	161	12.5	14.0	13.6
Level 2	10.0	58	N/A	N/A	N/A
Level 1	10.6	85	N/A	N/A	N/A
Levels 2 & 1	10.4	143	N/A	11.7	11.4

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Levels of Government. When compared to Agor's governmental levels, the Air Force joint sample mean score was consistently lower. The Air Force mean was 1.675 below the average of the four government means (Table 47).

Table 47. Score on Potential Intuition Scale (By Government Level) (4:23)

	Air Force	Agor* National Gov	Agor* State Gov	Agor* Local Gov	Agor* County Gov
N:	304	441	414	595	229
Mean:	4.6	6.7	6.4	6.1	5.9

*Agor's government samples are from his national ASPA sample.

Gender. A comparison of Air Force joint sample means by gender and Agor' equivalent sample means revealed that the Air Force mean was consistently below the means of each of Agor's samples. However, the Air Force mean was virtually the same as that of Agor's military mean for males (intuition/integration: 10.3, 10.7 respectively; intuition: 4.6, 4.9 respectively) (Table 48).

Table 48. Combined Scores on Intuition/Integration and Intuition (By Gender) (4:25)

	Intuition/Integration		Intuition	
	Male	**Female**	**Male**	**Female**
Air Force	10.3	11.8	4.6	5.0
Agor Military	10.7	14.4	4.9	6.4
Agor ASPA	13.7	14.3	6.4	6.9
Agor Civil Servants	12.7	13.3	5.7	6.3
Agor Educators	15.6	16.3	7.7	8.7
Agor Politicians	13.3	13.5	6.5	6.6

General Perspective. When the Air Force joint sample population was compared to Agor's military sample population in general terms, without regard to demographics, it is noted that the Air Force means for intuition/integration and intuition were less than Agor's sample means, albeit the difference was not as great as was noted for demographically qualified means (i.e., intuition/integration difference: 0.7; intuition difference: 0.5) (Table 49).

Table 49. Combined Military Scores on Intuition/Integration and Intuition (4:27)

	Intuition/Integration	Intuition	N
Air Force	10.4	4.6	304
Agor Military*	11.1	5.1	50

*Sample exclusively of Emergency Preparedness Personnel

Summary

The data collect on 304 Air Force field grade officers was analyzed vis-a-vis the ten research question, some of which had subordinate questions. Relationships, frequencies, comparisons, et. al., were examined and statistically significant findings were noted. The following chapter will discuss those findings, make general conclusions, and make specific conclusions to the test hypothesis (of Chapter III) and research hypothesis (of Chapter I).

V. Discussion and Conclusions

Introduction

This chapter discusses the findings of the data analysis of Chapter IV and draws conclusions. It ends with conclusions concerning the test hypothesis and research hypothesis.

Since the sample population was fairly small (compare Table 12) and the significance level was limited by direction to .90 (58), this discussion and resulting conclusions must be kept in general terms and limited to a general characterization of the population at large.

The reader is referred in the discussion below to the tables in Chapter IV containing the related data analysis. Though not specifically referenced, the narrative associated with those tables is also inferred because it gives analysis particulars germane to the discussion in this chapter. Should the reader have specific questions precipitated by the following discussion, he/she is referred to the narrative of Chapter IV.

Discussion

Characterization of Intuition in the Sample Population.

Right-brain Dominant. The data clearly showed that right-brain dominance (i.e., intuition dominance) was very limited within the sample population: i.e., 3% (Table 15). Not only was it limited in numbers, but right-brain

scores were consistently low as compared to the possible score (maximum score of 8 out of 15 possible). Moreover, left- and integrated-brain dominance were relatively equivalent (46% and 42% respectively) (Table 16). The literature points out that all three are needed within the decisionmaking arena and that integration needs to be in the majority. Additionally, to increase integration where left-brain dominance prevails, right-brain enhancement skills need to be taught to and practiced by left-brain dominant persons.

All right-brain officers were male and White/Non-hispanic/Caucasian (Tables 17 and 18). According to the literature, one would have expected more female than male representation, and Latin, Oriental, and Black ethnic representation over White/Non-hispanic/Caucasian. Perhaps, as with Agor's assessment of Blacks, they have assumed the cognitive disposition of the majority within the given environment in order to be successful (4).

Additionally, the right-brain mean scores show no statistically significant difference between management levels (Table 19). One would have expected to see an increase in scores of those who remained right-brained (i.e., did not become integrated) as increase in position gave opportunity for more intuitive decisionmaking.

Lastly, only 2 percent of the right-brain sample population was promoted below-the-zone (Table 20). As

compared to the left- and integrated-brain officers, this may indicated that the promotion profile of early promotees does not normally contain a right-brain dominance profile.

Integrated-brain Dominant. The integrated-brain scores for the sample population was virtually the same across all three grades (Table 16). One would have expected a greater score as grade increased and experience and position gave rise to more integration.

Gender showed no statistically significant difference (Table 17). One would have expected to see greater integration for females, per the literature; albeit, it is consistent with no finding of right-brain dominant female officers, as discussed above.

The integrated mean scores of American Indian, et. al. and Latin American, et. al. showed statistically significant difference (i.e., the Latin American, et. al. group was much higher than the American Indian, et. al. group) (Table 18). One would have expected similar mean scores. If, as with Agor, these ethnic groups are adopting the cognitive disposition of the majority, then perhaps some have adopted it better than others.

Management levels showed no statistically significant difference (Table 19), whereas, one would have expected to see an increase in mean scores as level of management increased, thereby showing development of this cognitive preference.

Selection for below-the-zone promotions was equivalent to that of left-brain for both one- and two-time selectees (Tables 20 and 21). Very unusual though was the finding that the integrated-brain mean score decreased instead of increased as BTZ grade increased, with a statistically significant difference between scores for the grades colonel and major. Stratification by grade showed this significant difference was mirrored by the colonel stratification (Table E.5). Since left-brain dominance held steady for BTZ across the three grades, as well as for the joint sample population (without regard to BTZ promotion), no reasons for this pattern exists in the data. However, it would be reasonable to postulate that a strong left-brain dominant environment could progressively mitigate against integration as more senior positions are attained.

Potential Intuitive Ability. Only 27% of the sample population rated as having potential intuitive ability (Table 22). Those so rated received relatively high scores (9.25 out of 12) (Table 22) which, however, were not statistically significant across the grades as one would expect (Table 23).

Female potential intuition was somewhat equivalent to potential thinking (45% to 55% respectively) (Table 24); however, males showed a much greater difference (29% to 71% respectively). One would have expected to see a higher percentage of females with potential intuitive abilities;

nevertheless, these findings are consistent with that discussed earlier for female right-brain and integrated-brain profiles. Since brain dominance (as discussed above) is an indication of cognitive preference on the job, it appears, for both genders, that there is much greater underlying potential for intuition than is actually practiced on the job.

Whereas all ethnic groups were represented in the thinking potential profile, only American Indian, et. al.; Latin American, et. al.; and White, Non-hispanic, Caucasian, et. al.) were represented in the intuitive potential profile (Table 25). Although American Indian, et. al. and Latin American, et. al. were not represented in the previous right-brain category, as one would have expected, they are represented here in the intuitive potential category, as one would expect. This may suggest that a left-brain dominant environment has significantly influenced their actual cognitive style on the job, although it has not extinguished their underlying intuitive potential.

An increase in management levels did not generally show a change in the mean score of potential intuitive ability, with the exception of the stratified grade of lieutenant colonel (Table F.6). The same held true for potential thinking ability, except no stratified difference was noted. Additionally, the three levels of management showed nearly equivalent percentages of potential intuitive ability

(Tables 26), indicating that potential intuition remained fairly constant as one's position increased. Although, according to the literature, potential can be increased over time with training and application (i.e., experience) , these findings indicate that neither thinking nor intuition is being influenced by such processes.

The differences of the mean scores for potential intuitive ability were not statistically significant for the three below-the-zone promotion grades, nor were the differences of those means from the general population means statistically significant (compare Tables 23 and 27). Since a right-brain dominant profile may not be typical of early promotees, this finding may additionally indicate (as discussed above) that potential intuitive ability neither adds to nor takes away from potential for early promotion. Since brain dominance is overt and is a measurable performance factor, and potential is covert and theoretically unknown to a promotion board, such a postulate is consistent with the promotion process.

Intuitive Management Types. Twenty five percent of the joint sample population was characterized as intuitive management types (i.e., left/intuitive; right/intuitive; integrated/intuitive) (Table 29). This percent is a natural outcome of the percents of brain dominance and potential ability. No statistically significant dependencies exist between grades, gender,

management levels, or below-the-zone promotion selection and these management types. There were insufficient data points to perform statistical tests with ethnic groups.

Relationship Between Right-brain Management Style and Intuitive Potential Ability. A test of correlation between right-brain management style and intuitive potential ability revealed only moderate correlation (r = .4140). One would have expected a high correlation between these two elements. This indicates, in terms of right-brain and intuition, that what one actually practices on the job only moderately correlates to one's inherent potential. As seen in later discussion, this does not seem to affect job satisfaction.

Relationship Between Integrated-brain Management Style and Intuitive Potential Ability. A test of correlation between integrated-brain management style and intuitive potential ability revealed minute negative correlation (r = -.0068, 44 cases). However, a further examination of grade stratified samples revealed the following: colonels, r = -.1817, 18 cases; lieutenant colonel, r = -.0946, 10 cases; major, r = .3012, 16 cases, thereby indicating from major through colonel a possible diminishing correlation along a positive to negative continuum. Simply put (when compared to the results of Tables 16 and 23), this indicates that for this sample, as

grade increases, less officers with a potential intuitive ability profile have an integrated-brain dominant management style.

Like/Dislike Occupation. More than twice as many (as measured by percent) right-brain officers dislike their occupation than do left- or integrated-brain officers. (Table 35). By grade, the dislike percent is higher for colonels and lieutenant colonels and nonexistent for majors.

The like/dislike percentages by grades and as a joint profile show a slightly higher "like" level of integrated-brain officers over left-brain officers for the grades of colonel and lieutenant colonel, with a slightly lower "like" level of majors. Moreover, for the grade of colonel, statistically significant dependency exists for like/dislike versus occupational satisfaction, with left- and integrated-brain colonels clearly liking their occupation much more over the right-brain colonels (Table E.8).

This would seem to indicate that for this sample, as one advances in grade, if one is to find occupational satisfaction in the Air Force military environment, there is of necessity a move away from a right-brain profile toward left- or integrated-brain profiles, with integration having a slightly better satisfaction rating for the military occupations. This indication is consistent with the two Pearson Product Moment Coefficients of Correlation r discussed above and with the literature.

When viewed by way of potential ability (i.e., thinking and intuition), it was found that each potential ability category liked their occupation equally (Table 36). No statistically significant dependency was found for potential ability and satisfaction, or AFSC and satisfaction by potential ability (Table 36). This is not consistent with the literature which suggests that frustrated potential ability (i.e., ability not realized) leads to job dissatisfaction.

The Five Steps of Problem Solving. As seen in the data analysis, each category of brain dominance picked Step One ("Identify the Problem") as the one in which they perceived they were "Best," and right-brain officers stated it was the step requiring the least amount of their time (Table 37); a test of independence showed no dependency. This is expected and is consistent with the literature which indicates that each brain dominance profile can do this naturally, and right-brain officers, being characterized with a global perspective, can typically do it more quickly.

Step Two ("Determine Alternative Solutions") showed right-brain dominance to have a stronger margin of "Perceived Best" over "Perceived Worst" when compared with left- and integrated-brain dominance, though no statistically significant dependency exists. This is anticipated, in that right-brain dominance is expected to be better at generating problem solutions, per the literature.

One would expect to see integrated-brain dominance as somewhat stronger than left-brain dominance in "Best" over "Worst," and that is what did occur.

Step Three ("Evaluate the Alternatives") clearly showed that right-brain dominance had much greater difficulty in performing this step than did either left- or integrated-brain dominance. Because of the analytical nature of this step, this is completely expected. Statistically significant dependency exists. On the other hand, both left- and integrated-brain dominance reported greater time required in this step than did right-brain dominance. This also is expected. Analysis (i.e., left-brain dominance) is by nature time consuming, as each alternative is weighted. One would expect to see left-brain dominance taking more time than integrated-brain dominance because of its purely anal,tical approach to the majority of problem solutions. That is what in fact occurred.

Step Four ("Select a Solution") visibly showed that right-brain dominant officers had more difficulty selecting a solution and took far more time than than did either left- or integrated-brain dominant officers. The findings showed statistically significant dependency. The results are as expected.

According to the literature, both left- and integrated-brain dominant officers are typically better at terminating the decisionmaking process. Since they have

already evaluated the alternatives in detail, spending most of their time on that analysis, they quickly come to a solution selection. Right-brain officers, on the other hand, are typically the idea champions, and since they are "Worst" at evaluating alternatives, they are predicably slow at selecting a solution.

Perception of Being Intuitive. The survey participants were given the following definition to consider when ask if they thought their decisionmaking style could be characterized as intuitive, and if they felt they were intuitive by nature, without regard to how they may actually make decisions:

> Intuition is direct knowledge or awareness of something without conscious attention, analytical analysis, concentration, or conscious reasoning; an unconscious perception or apprehension. (Appendix A:6)

By Brain Dominance (i.e., Management Style). On the first question, the right-brain officers showed a much stronger use of intuition in decisionmaking than did either left- or integrated-brain dominant officers. This was expected. Additionally, a slightly higher percent of integrated-brain dominant officers felt they used intuition in decisionmaking over left-brain dominant officers. This also was expected. Statistically significant dependency exists. Though one would have expected to see more than just a slight edge over the left-brain dominant officers, this finding is consistent with other findings discussed earlier in this chapter.

In response to the second question, the officers that felt they were intuitive by nature increased by percent of the sample population category as one moves from left-, to right-, to integrated-brain dominance (Table 40). Statistically significant dependency exists. One would have expected to see the percent increase as one moved from left-, to integrated-, to right-brain dominance. Perhaps, as with Goldberg (51), integrated-brain dominant officers, who are comfortable using either brain hemisphere, believe they have by that ability demonstrated a greater intuitive edge.

By Potential Ability (i.e., Thinking; Intuition). When these questions were reviewed by potential abilities (i.e., thinking and intuitive) the same pattern as question one above was seen. Potentially intuitive officers showed a much stronger use of intuition in decisionmaking than did potentially thinking officers. This was expected. Statistically significant dependency exists.

On the second question, potential intuitive officers felt they were intuitive by nature more than did the potentially thinking officers. This was expected. Statistically significant dependency exists.

Value of Intuition. The survey sample population clearly felt that intuition was either invaluable or was a very useful resource in solving problems (Table 43). Without exception, none felt it had virtually no value at

all and only 7% felt it had limited value. This is congruent with the encouragement of the literature.

When evaluated by management level, it was found that there was statistically significant dependency. Management levels 3 and 1 were nearly equal to each other, except for opinion category 2: "Is very useful...," where management level 1 was more than twice the value of level 3. Moreover, management levels 3 and 1 were consistently higher in every opinion category than management level 2.

This may indicate that as one moves well into middle management (lieutenant colonel grade), the influences and expectations of the given environment, in term of analysis over intuition, or objectivity over subjectivity, have their greatest impact. The slight edge of integration over left-brain dominance for the grade of colonel, as discussed earlier, may then account for a renewed recognition of the value of intuition at Management Level 3.

Comparison to Agor. When the results of the data of Chapter IV were compared to Agor, it was seen that the means for potential intuition and combined intuition/integration were consistently below Agor's means (Tables 45 and 46). This held true when the mean of potential intuition was compared to Agor's equivalent government means (Table 47), as well as a comparison by gender of potential intuition and combined potential intuition/integration (Table 48). Moreover, a comparison of Agor's military (i.e., limited

exclusively to Emergency Preparedness Personnel) means for potential intuition and combined potential intuition/integration gave the same pattern. Therefore, one could conclude that the Air Force field grade officers sampled have less intuitive ability than comparable non-Air Force decisionmakers. Since these officers came originally from the non-Air Force environment, this difference may be the result of Air Force corporate inculturization (6).

Conclusions

The following conclusions are drawn from the data analysis of Chapter IV and previous discussion of this chapter. They are followed by conclusions on the test hypothesis of Chapter III and research hypothesis of Chapter I.

General Conclusions. The following are the fifteen general conclusions reached as a result of this research:

1. Right-brain dominance is minimal in the Air Force among field grade officers. Additionally, where found, the strength of right-brain dominance is less than that found in the civilian professional environment.

2. Left- and integrated-brain dominance are equivalent in the Air Force among field grade officers.

3. Typically intuitive ethnic groups (i.e., female; Asian, Hispanic; American Indian; Black) have adopted the

logical, analytical, and objective cognitive predisposition of the Air Force environment, though not at identical rates.

4. Left-brain dominant influencing factors are slightly stronger than integrated-brain dominant factors for field grade officers in the Air Force military environment.

5. Once assimilated to the logical, analytical, and objective environment of the Air Force, field grade officers refreeze in that cognitive predisposition and change little over time in terms of lessoning or strengthening their cognitive predisposition.

6. A right-brain dominant management style is atypical of below-the-zone promotion selectees.

7. There is greater underlying potential intuitive ability than is actually practiced on the job.

8. Potential intuition that is not acted out in actual management style is nonetheless maintained by the officers concerned and is not extinguished.

9. For those officers profiled as having potential intuition, potential intuition remains fairly constant over time.

10. Potential intuition, in and of its self, does not add to or take away from one's promotability below-the-zone.

11. For those that profile as potential intuitives, their management style only moderately correlates to their potential intuitive ability.

12. The Air Force military environment is not necessarily the best choice of profession for right-brain dominant officers, who maintain that brain-dominance over time, especially as one approaches the grade of colonel.

13. In problem solving, for officers with intuitive characteristics (right- and integrated-brain dominant), right-brain dominant officers are good at problem identification and determining alternative solutions, but are weak in evaluating alternatives and selecting a solution. Integrated-brain dominant officers are good at problem identification, weak at determining alternative solutions, moderately capable at evaluating alternatives, and are good at selecting a solution.

14. Air Force field grade officers have a reasonably accurate grasps of how they use intuition in their decisionmaking.

15. Air Force field grade officers recognize that intuition has value in decisionmaking.

Test Hypothesis. The test hypothesis of Chapter III was as follows:

Ho: United States Air Force field grade officers do not characteristically use analytical, logical, and rational thinking in their decisionmaking processes.

Ha: United States Air Force field grade officers characteristically use analytical, logical, and rational thinking in their decisionmaking processes.

Based on the findings of the data analysis and the aforementioned conclusions, the null test hypothesis is rejected.

Research Hypothesis. The research hypothesis is the alternative hypothesis stated above. It was based on the findings of Agor (4:27), Myers-Briggs (102-253-292), and Campbell (35:b1). It is affirmed by this research.

Summary

This chapter has given the discussion concerning the findings of the data analysis and the resulting conclusions. The following chapter will address a summary of this research and recommendations considered appropriate.

VI. Summary and Recommendations

Introduction

This chapter concludes this research effort. It summarizes the thesis process and ends with recommendations that are considered appropriate.

Thesis Summary

The demand upon decisionmakers now and in the foreseeable future is to creatively and innovatively prevent and solve problems in the management arena. Moreover, the challenge exists for these same decisionmakers to be able "to see beyond tomorrow" (122:7) and provide effective and insightful leadership and management.

For the United States Air Force, to be imbued with innovation and not encumbered by tradition have been hallmarks of her remarkable achievements. However, the blessings of Frederick Taylor may be only temporal if analysis and logic remain a primary pillar of her corporate policy.

This thesis predicated its design on the hypothesis that Air Force field grade officers characteristically use analytical, logical, and rational thinking in their decisionmaking processes. Research questions were developed which helped explore that hypothesis. The scope was

limited to Air Force field grade officers, who represented the core of corporate management and decisionmaking.

A survey of the relevant literature indicated that intuition in not new to human thought or decisionmaking. Jung considered it to be "irrational" (68:82), because it was a "perceiving" function as opposed to a "reasoning" function. He classified human personality in terms meaningful to human behavior and decisionmaking, which thirty years later served as the impetus for the development of the Myers-Briggs Type Indicator (MBTI). That tool, which served as a basis for the survey instrument of this research (Appendix A), became useful in identifying intuitive personality types and has demonstrated over time "that much seemingly random variations in human behavior is actually quite orderly and consistent, being due to certain basic differences in the way people prefer to use perception and judgment" (102:1).

The literature clearly correlated intuition and creativity; brain research helped clarify the role of brain dominance in cognitive predisposition; and proponents of the decision sciences and various decision support systems (e.g., management information systems; decision support systems, et. al.), acknowledged the inherent role and importance of intuition in decisionmaking and decision support systems.

A central motif in the literature was that both left- and right-brain skills, and their combination (integration) are necessary for creative problem solving and decisionmaking, especially given the many decisions under uncertainty. The best of all environments is to have an organization with all three represented, cultivated, and rewarded, with the majority being integration. Campbell concluded from his studies in military decisionmaking that "diplomatic ingenuity, interpersonal sensitivity and creative vision" (35:b2) necessitate this environment: the logical/analytical milieu by itself will not suffice.

Another central motif in the literature was that past experience, personal perceptions, beliefs, values, education, and training, have a much greater effect on cognitive style than do natural tendencies.

From the perspective of intuition, Agor identified integrated-brain/intuition and right-brain/intuition as the most productive intuitive management types.

Finally, according to the literature, the future beckons the nurturing of intuition, with the hope of achieving integration for the majority. Ultimately, according to Agor, to achieve higher productivity, an organization needs to create a climate "in which intuitive brain skills and styles can flourish and be integrated with more traditional management techniques" (7:43).

The research methodology sought to explore the role of intuition in the decisionmaking processes of Air Force field grade officers. Using the instrument at Appendix A, the methodology resulted in the random collection of data from 304 Air Force field grade officers. That data was analyzed and statistically significant relationships were identified. The findings of the data analysis were discussed and reasonable, albeit general, conclusions were made. Those conclusions served as the basis to reject the null test hypothesis.

Recommendations

The recommendations that follow point to the necessity of developing right-brain skills within the Air Force field grade officer population.

Left-brain skills themselves are essential among the subject population because they are the bases of logical, rational, and systematic thinking and decisionmaking. They meet many needs within the Air Force in areas where a quantitative, deductive, and analytical approach is best. But exclusive left-brain skills severely limit an Air Force field grade officer's capacity to be imaginative, to have a global perspective, to work in an unstructured and unplanned environment, and to be effective where logic, reason, and the scientific method are not necessarily appropriate.

Right-brain skills, when developed and used, afford the left-brain dominant field grade officer necessary skills in which he or she may be limited. Not only do these skills include inductive reasoning skills, so requisite in specific-to-general thinking, such as in generating alternative problem solutions, but they also encompass a much better global perspective, as well as a fluid and spontaneous capacity in confronting problems. They are, therefore, clearly dominant and coveted skills in collegial and participatory management structures.

By creating a climate that encourages and fosters the development of right-brain skills among the subject population, the Air Force would be shepherding the professional development of its middle and senior managers toward an integrated-brain style. That style, which selectively uses left- and right-brain skills, characterizes managers that make their decisions by use of facts and intuition, after pursuing available information and receiving inputs from the management resources and personnel in an organization. Such, according to the literature, is the ideal management style.

The Air Force needs to remain effective in the future and able to meet the perpetually new challenges of decisionmaking. In doing this, there is no danger in maintaining capable and necessary left-brain dominant field grade officers. However, as with Leavitt, there is a danger

of accepting a unidimensional decisionmaking methodology in a multidimensional world (79). Therefore, in light of the findings of this research effort, the following recommendations are made:

1. First and foremost, it is recommended that Air University and Air Training Command incorporate courses into their respective graduate, Professional Continuing Education, and technical training programs that will help stimulate right-brain skill development in Air Force officers, such as the course on "Creativity in Business" at Stanford University (3:15; 8:50; 10:50). Right-brain skills involve an inductive and subjective style, with a preference for solving problems by looking at the whole, then seeking to solve the problems through insights. Most typically correlated tasks include nonroutine, broad issues, and idea generation.

It is further recommended that they follow-up the institution of such programs by periodic Air Force-wide cognitive dominance testing to ascertain the programs' affectiveness. AFIT student thesis efforts could be used to perform the necessary periodic testing and evaluations.

These proposed enhancements to Air Force programs would be essential elements in the encouragement of the development of Air Force officer right-brain skills, which in and of itself is necessary for the brain dominance integration of the Air Force officer left-brain dominant

population. Though having representation from each of the brain dominances is indeed healthy and useful for the Air Force, a high officer left-brain dominance (46% for this research sample) is not necessarily considered in the best interest of the Air Force.

2. It is recommended that the Air Force senior executive leadership conduct a policy review, across the board, to determine how changes to policy can serve as a basis for fostering incorporation of viable right-brain skills within Air Force officers for greater creativity, innovation, and decisionmaking effectiveness. Such encouragement of right-brain skill development will further foster integrated-brain development and serve the interests of the Air Force, as depicted in question number one above. Once policy changes are determined, then the necessary changes should be executed expeditiously. The testing in recommendation number one above could serve as a basis for determining the effectiveness of this effort, as well as the overall enhancement effort.

3. It is recommended that the Air Force Manpower and Personnel Center, in coordination with the Air Force Human Resources Laboratory, create an Air Force prototypical Brain Skill Management Program, along the lines of Agor's program (6; 7:42), for Air Force-wide implementation. Such a program would serve the needs of the Air Force in officer accession management, officer assignment selection, and

other officer personnel matters by adding a cognitive dominance identification mechanism to the personnel management process. By routinely placing officers, when possible (the needs of the Air Force notwithstanding) against billets which are most congruent with their cognitive dominance or necessary professional cognitive development, the Air Force would be in a much better total personnel management posture than is currently the case.

This program, of necessity, should include cognitive dominance (left-, right-, and integrated-brain) and potential ability (thinking and intuition) testing of officer candidates and periodic testing of active duty officers as part of the testing specified in recommendation number one above.

4. It is recommended that an AFIT graduate student, as a thesis project, conduct a stress and tension study, along the lines of Girdano and Everly (8:52), to ascertain to what extent Air Force officer health is linked to whether their brain skills are properly matched to their AFSC's. Since this correlation is resident in the literature, it is reasonable and justifiable to postulate that a similar relationship may exist among Air Force officers. If so, the results of a study of this nature would be valuable information for the proposed Air Force Brain Skill Management Program and/or useful for current AFSC placement decisions.

5. It is recommended that an AFIT graduate student, as a thesis project, conduct experimental design research on the effects of computer operating systems and computer software vis-a-vis brain dominance, using Davis and Olson (31), Markus and Robey (90), Koester and Luthans (74), and Lucas (87) as a starting point.

Such research should be designed to explicitly relate brain dominance to productivity and personal software feature preference as regards operating system and software design. The literature has clearly expressed that current software design is implicitly left-brain dominant in design, whereas the incorporation of right-brain design features may in fact prove to be quite effective in terms of software learnability and on-the-job productivity. The results of the research could then serve as one of the bases of future Air Force software design decisions.

6. It is recommended that an AFIT graduate student, as a thesis project, duplicate this research at a confidence level of .95. A .90 confidence level, as with this research, only allows for generalizations. A confidence level of .95 would either confirm or refute the findings of this research and would give further credence for any forthcoming duplicate research recommendations.

7. It is recommended that an AFIT graduate student, as a thesis project, duplicate this research for pilots of fighter aircraft. The information gained from that research

could be used to identify the cognitive profiles of those officers determined to be the Air Force's most successful or least successful fighter pilots and to determine if there are statistically significant relationships between brain dominance and pilot success. Any significant relationships could conceivably have pilot selection implications.

Moreover, the research could serve as the basis for strategic directions in pilot/technology interface. Pilot decisionmaking is predicated in part on information management, and pilot information is gained from a variety of physical and technical sources. A study of cognitive dominance and the strengths and weaknesses of that dominance in pilot decisionmaking could serve as a basis for cockpit instrumentation design and pilot information management.

8. It is recommended that an AFIT graduate student, as a thesis project, duplicate this research for Air Force general officers. Preliminary research done by the AFIT/LSM faculty indicates that Air Force general officers tend to be more intuitive (right-brain or integrated-brain) than field grade officers surveyed in this research. Those preliminary findings, predicated on the Myers-Briggs instrument detailed in Chapter Three, should be further examined by the use of the instrument in Appendix I. The results of the research could then be used to profile Air Force general officers against target public and private sector counterparts, with

the intent of determining areas considered exceptional as well as those considered worthy of enhancement in general officer grooming efforts.

Summary

This chapter concluded this research effort. It addressed a summary of the research and concluded with recommendations considered appropriate.

Appendix A. Survey Instrument

Survey Control Number: 89-07

Expires: 1 Jun 89

EVALUATION OF MANAGEMENT STYLE

AND

POTENTIAL MANAGEMENT STYLE

Recent scientific research indicates that humans use the two sides of their brains very differently. The left side appears to handle analytical and verbal tasks (deductive), while the right side specializes in intuitive nonverbal thought (inductive). We tend to depend on one hemisphere of our brain more than the other. This pattern affects how we go about doing our present jobs, our productivity, and the satisfaction we get from our work.

By completing this questionnaire, you will be making an important contribution to research currently being conducted at the Air Force Institute of Technology. That research involves an in-depth analysis of decisionmaking in the Air Force.

This questionnaire will take approximately 15 minutes of your time. Please answer as honestly as you can, forgetting for the moment the management philosophy of your command or organization. We want to know about you and your preferences.

At this time, please **annotate your Primary AFSC** (without prefix or suffix) on AFIT Form 11D in the "Social Security Number" area in the upper left corner of the first page.

Please annotate the letters corresponding to your answers on AFIT Form 11D and return that form in the enclosed envelope. Select only <u>one</u> answer per question.

1. I prefer to concern myself with

   a. what I can be sure of--the well-established truths.

   b. hidden possibilities, uncertainties, and potentials.

   c. both sets equally.

2. If there are several things I must do,

   a. I'll probably attempt to deal with them simultaneously.

   b. I'll probably pick one, complete it, then move on.

   c. I'm equally likely to concentrate on one thing at a time or deal with several things at the same time.

3. If I am presented with a task to perform, I tend to

   a. organize it sequentially.

   b. organize it by showing relationships among the components.

   c. have no preference between sequential and relational organization.

4. This statement best applies to me:

   a. I use time to organize myself and my activities.

   b. I have difficulty in pacing my activities to meet deadlines.

   c. I pace my activities to time limits with ease.

5. I work best at

   a. improving something.

   b. inventing something.

   c. both improving and inventing.

6. I am

   a. not very conscious of body language; I prefer to listen to what people say.

   b. good at interpreting body language.

   c. good at understanding what people say and also the body language they use.

7. I have

   a. a preference for thinking concretely.

   b. a preference for abstract thinking.

   c. no preference for either concrete of abstract thinking. I think both concretely and abstractly.

8. I usually solve problems

   a. logically and rationally.

   b. according to my feelings.

   c. with both logic and feelings equally.

9. When I am being given instructions, I

   a. prefer a verbal description.

   b. prefer a demonstration.

   c. am equally satisfied with a description or a demonstration.

10. While solving problems, I

    a. usually take a playful approach.

    b. usually take a serious, businesslike approach.

    c. am equally likely to take a playful or a serious approach.

11. I like my work to be

a. planned, so that I know exactly what to do.

b. unplanned, so that I can concentrate on whatever I feel like doing.

c. planned, but allowing me opportunities to change as I go along.

12. I respond more to people when they

a. appeal to my logical side (my intellect).

b. appeal to my emotional side (my feelings).

c. appeal equally to my emotional and my logical sides.

13. I prefer to learn

a. through exploration.

b. by examination.

c. through exploration and by examination equally.

14. When I'm reading about something new, I'm most likely to remember

a. the main ideas.

b. facts and details.

c. both the main ideas and details.

15. I have

a. a preference for outlining over summarizing information.

b. a preference for summarizing over outlining.

c. no preference between summarizing and outlining.

16. Do you usually get along better with

a. imaginative people?

b. realistic people?

17. In doing something that many other people do, does it appeal to you more to

a. do it in the accepted way?

b. invent a way of your own?

18. Is it higher praise to say someone has

a. vision?

b. common sense?

19. Would you rather be considered

a. a practical person?

b. an ingenious person?

20. Would you rather have as a friend someone who

a. is always coming up with new ideas?

b. has both feet on the ground?

Which word <u>in each pair</u> below appeals to you more?

21.	a. theory	vs.	b.	certainty
22.	a. build	vs.	b.	invent
23.	a. statement	vs.	b.	concept
24.	a. facts	vs.	b.	ideas
25	a. concrete	vs.	b.	abstract
26.	a. theory	vs.	b.	experience
27.	a. literal	vs.	b.	figurative

28 I like my occupation and feel it is right for me.

a. Yes

b. No

Please use the following, basic definition of "intuition" for questions 29-31:

> Intuition is direct knowledge or awareness of something without conscious attention, analytical analysis, concentration, or conscious reasoning; an unconscious perception or apprehension.

29. I feel my decisionmaking style uses intuition and could be characterized as intuitive

a. most of the time.

b. some of the time.

c. none of the time.

30. Regardless of how I approach my decisionmaking responsibilities, I personally feel that I am an intuitive person by nature.

a. Yes

b. No

31. The following best characterizes my opinion of the value of intuition in the decisionmaking process: Intuition:

a. is invaluable.

b. is a very useful resource in solving problems.

c. has average value.

d. has limited value.

e. has virtually no value at all.

The following information pertains to questions 32-35.

THE FIVE STEPS OF PROBLEM SOLVING

Step 1: Identify the Problem

Step 2: Determine Alternative Solutions.

Step 3: Evaluate the Alternatives.

Step 4: Select a Solution.

Step 5: Implement Selection.

Choosing among steps 1-4, in which step do you

32. Perform BEST?

    a. Step 1

    b. Step 2

    c. Step 3

    d. Step 4

33. Perform WORST?

    a. Step 1

    b. Step 2

    c. Step 3

    d. Step 4

34. Spend the MOST amount of time?

    a. Step 1

    b. Step 2

    c. Step 3

    d. Step 4

35. Spend the LEAST amount of time?

a. Step 1

b. Step 2

c. Step 3

d. Step 4

36. What is your current grade?

a. Colonel

b. Lieutenant Colonel

c. Major

37. What is your gender?

a. male

b. female

38. What is your ethnic background?

a. American Indian, Alaskan Native

b. Asian American, Asian Indian, Oriental, Southeast Asian

c. Filipino

d. Pacific Islander

e. Black Non-Hispanic

f. Mexican American, Chicano

g. Latin American, Puerto Rican, Cuban, other Hispanic

h. White Non-Hispanic, Caucasian, European, Middle Eastern, North African

i. Other

39. What is your category of leadership/management?

a. Commander (or Deputy Commander), Group level and above; Director (or Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

b. Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

c. Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Were you selected for early promotion (below-the-zone promotion) to any of the grades indicated in questions 40-42?

40. Colonel

a. Yes

b. No

41. Lieutenant Colonel

a. Yes

b. No

42. Major

a. Yes

b. No

If you have not already done so, please **annotate your Primary AFSC** (without prefix or suffix) on AFIT Form 11D in the "Social Security Number" area in the upper left corner of the first page.

Paragraph 1 and questions 1-28 and 38 are reprinted by permission of Simon Schuster Publishing, Prentice-Hall, Inc., with credit to:

Weston H. Agor, Ph.D., INTUITIVE MANAGEMENT (Englewood Cliffs, N.J., Prentice-Hall, 1984)

Appendix B. Survey Instrument Reprint Request

Captain Norman L. Watson
1462 South Maple Avenue
Fairborn, Ohio 45324

July 16, 1988

Director, Subsidiary Rights
Prentice-Hall, Inc.
Englewood Cliffs, N.J. 07632

Dear Director:

I am a United States Air Force officer currently undergoing a graduate program in Information Resources Management at the Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio. As part of that educational program, I am studying the subject of intuition in the decisionmaking processes of selected Air Force officers. Germane to my research will be the use of a validated survey on intuition and decisionmaking.

In 1984, you published the work of Dr. Weston H. Agor entitled Intuitive Management. On pages 11-14, Dr. Agor included a "Test Your Management Style" questionnaire. It is that questionnaire that I am requesting permission for reprint. Specifics are as follows:

Intuitive Management, pages 11-14

Utilized one time only as part of a questionnaire for my Master of Science degree thesis

Sample population will be United States Air Force officers numbering up to but not exceeding 2000

Quantities of reproduction requested: 2000

A credit line for author, publisher and book will be placed on the reproduced material using the credit line you specif

Thank you for your thoughtful consideration in this matter.

Sincerely,

Norman L. Watson

Norman L. Watson

Appendix C. Survey Instrument Reprint Permission

SIMON SCHUSTER

August 19, 1988

Captain Norman L. Watson
1462 South Maple Avenue
Fairborn, Ohio 45324

We are happy to grant you permission to quote from our publication,

INTUITIVE MANAGEMENT by Weston H. Agor, Ph.D.

in accordance with the conditions outlined in your letter of

July 16, 1988

Please credit the author(s), the title and the publisher with copyright year(s). Our usual credit line appears below:

Weston H. Agor, Ph.D., INTUITIVE MANAGEMENT
(Englewood Cliffs, N.J., Prentice-Hall, Inc., 1984)

Sincerely,

Alice Corring
Trade Contracts/Permissions Administrator

AC/bg

Prentice Hall Building, Englewood Cliffs, NJ 07632 (201) 592-2000 A Gulf+Western Company

Appendix D. Survey Instrument Transmittal Letter

DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY
WRIGHT-PATTERSON AIR FORCE BASE OH 45433-6583

10 FEB 1989

REPLY TO ATTN OF: LSM

SUBJECT: Evaluation of Management Style and Potential Management Style: USAF Survey Control Number 89-07; Expires 1 Jun 89

TO: Questionnaire Selectees

1. Please take the next few minutes to complete the attached questionnaire and return it in the enclosed envelope by 1 Mar 89.

2. The questionnaire assesses your management style and potential management style in regard to deductive and inductive thinking. It will be used in a study of the decision-making processes of Air Force field grade officers. Your responses are vital to this research.

3. Your responses will be combined with those of other selected officers and will not be attributed to your personally. Although your participation is completely voluntary, your assistance is greatly needed and will certainly be appreciated. If you have any questions, please feel free to contact Major Norman Watson or Dr. Dennis Campbell at AUTOVON 785-5023. Thank you for your thoughtful and timely attention.

RICHARD S. CAMMAROTA, Colonel, USAF
Dean
School of Systems and Logistics

3 Atch
1. Questionnaire
2. AFIT Form 11D
3. Return Envelope

STRENGTH THROUGH KNOWLEDGE

Appendix E. Statistical Data By Grade of Colonel

The data presented in the following selected tables are exclusively on colonels and are in equivalent tabular form as found earlier in the joint assesment of colonels, lieutentant colonels, and majors. Several tables on colonels, which were comparable to the earlier joint assessment, were purposely left out because they provided only data of marginal tabular value. However, when individual elements were deemed substantive, they were singularly discussed in the narrative of Chapter IV.

Table E.1 Colonels by Gender, Ethnic Background, Management Level, and Below-the-Zone Promotion Selection (N=107)

Category	N	Percent of Sample
Gender N=107)		
Male	104	97
Female	3	3
Ethnic Background (N=107)		
American Indian/Alaskan Native	2	2
Black Non-Hispanic	1	1
Filipino	1	1
Latin American, Puerto Rican, Cuban, Other Hispanic	1	1
White, Non-Hispanic, Caucasian, European, Middle Eastern, North African	102	96
Management Level* (N=107)		
Level 3	68	64
Level 2	9	8
Level 1	30	28
Below-the-Zone (BTZ) Promotion Selection (N=39)		
To Colonel	16	15
To Lieutenant Colonel	14	13
To Major	9	8

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Table E.2. Colonel Brain Dominant Management Styles (In General)(N=107)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left	47	50	8.42	1.61
Right	5	5	6.60	0.89
Integrated	40	43	8.00	1.94
Indeterminate	8	9	N/A	N/A

Table E.3. Colonel Brain Dominant Management Styles (By Gender)(N=107)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=50; 47%)				
Male	47	50	8.42	1.61
Female	0	0	N/A	N/A
Right (N=5; 5%)				
Male	5	5	6.60	0.89
Female	0	0	N/A	N/A
Integrated (N=43; 40%)				
Male	37	40	8.29	1.68
Female	3	3	7.33	0.58
Indeterminate	8	9	N/A	N/A

Statistical tests:

1. Comparison of means; right-brain; insufficient data points.

2. Comparison of means; integrated-brain; Fails Parametric Assumptions--Wilcoxon Rank Sum Test, 2-tail, P .2150, no statistically significant difference.

Table E.4. Colonel Brain Dominant Management Styles (By Management Level*)(N=107)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=50; 47%)				
Level 3	27	29	8.66	1.84
Level 2	4	4	7.50	0.58
Level 1	16	17	8.24	1.25
Right (N=5; 5%)				
Level 3	2	2	6.00	0
Level 2	1	1	8.00	0
Level 1	2	2	6.50	0.07
Integrated (N=43; 40%)				
Level 3	27	29	8.38	1.64
Level 2	3	3	8.00	1.00
Level 1	10	11	7.91	1.92
Indeterminate	8	9	N/A	N/A

Statistical Tests:

1. Comparison of means; right-brain; insufficient data points.

2. Comparison of means; integrated-brain; Kruskal-Wallis ANOVA, KW 1.3037, df 2, P .5211; no statistically significant difference.

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Table E.5. Colonel Brain Dominant Management Styles (By Below-the-Zone Promotion Selection)(N=39)

Brain Dominance	Percent of Selectees	N	Mean	Std Dv
Left (N=18; 46%)				
To Col	21	8	9.00	1.41
To Ltc	13	5	9.00	2.16
To Maj	13	5	9.40	2.41
Right (N=0)				
To Col	0	0	N/A	N/A
To Ltc	0	0	N/A	N/A
To Maj	0	0	N/A	N/A
Integrated (N=17; 44%)				
To Col	18	7	7.80**	1.92
To Ltc	21	8	8.14	1.46
To Maj	5	2	11.00**	N/A
Indeterminate	10	4		

Statistical Tests:

1. Comparison of means, right-brain; insufficient data points.

2. Comparison of means; integrated-brain; failed parametric assumptions--Kruskal-Wallis ANOVA, KW 5.678, df 2, P .0899; statistically significant difference exists.

*P<.1
**P<.05
***P<.01
****P<.001

Table E.6. Colonel Potential Abilities
(By Management Level*)(N=107)

Potential Ability	Percent of Sample	N	Mean	Std Dv
Thinking (N=66; 62%)				
Level 3	36	39	9.67	1.77
Level 2	6	6	9.00	1.27
Level 1	20	21	9.76	1.55
Intuition (N=32; 30%)				
Level 3	20	21	9.19	1.94
Level 2	3	3	10.00	2.65
Level 1	8	8	9.38	1.85
Indeterminate	8	9		

Statistical Test: Comparison of means; intuition; Kruskal-Wallis ANOVA, KW .5151, df 2, P .7729; no statistically significant difference.

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Table E.7. Colonel Potential Abilities
(By Below-the-Zone Promotion Selection)(N=39)

Potential Ability	Percent of Selectees	N	Mean	Std Dv
Thinking (N=25; 64%)				
To Col	28	11	1.70	N/A
To Ltc	23	9	10.00	1.20
To Maj	13	5	8.80	2.05
Intuition N=10; 26%)				
To Col	13	5	9.33	2.08
To Ltc	8	3	8.50	2.12
To Maj	5	2	8.50	2.12
Indeterminate	10	4		

Statistical Test: Comparison of means; Intuition; Kruskal-Wallis ANOVA, KW .5833, df 2, P .7470; no statistically significant difference.

Table E.8. Colonel Occupation Satisfaction
(By Brain Dominant Management Style)(N=107)

Brain Dominance	Like Occupation Yes	No	AFSC's Responding No
Left (N=50; 47%)			
Number	46	4	0016, 1406, 2816, 4996
Percent	92	8	
Right (N=5; 5%)			
Number	3	2	0026, 4096
Percent	60	40	
Integrated (N=43; 40%)			
Number	42	1	0002
Percent of Integrated	98	2	
Indeterminate (N=9; 8%)			

Statistical Test: Management Style and Satisfaction; Overall Chi Square 9.698, df 2, P .0078; statistically significant dependency exists.

Left, Right: 2x2 Chi Square, P.0286

Integrated, Right: 2x2 Chi Square, P.0010

Left, Integrated: 2x2 Chi Square, P.2264

Table E.9. Colonel Occupation Satisfaction (By Potential Abilities)(N=107)

Potential Ability	Like Occupation Yes	No	AFSC's Responding No
Thinking (N=66; 62%)			
Number	62	4	0016, 0026, 1406, 4996
Percent	91	9	
Intuition (N=32; 30%)			
Number	30	2	0002, 4096
Percent	94	6	
Indeterminate (N=9; 8%)			

Statistical Test: Potential Ability and Satisfaction; Chi Square .001, df 1, P .9707; no statistically significant dependency exists.

Appendix F. Statistical Data By Grade of Lieutenant Colonel

The data presented in the following selected tables are exclusively on lieutenant colonels and are in equivalent tabular form as found earlier in the joint assesment of colonels, lieutentant colonels, and majors. Several tables on lieutenant colonels, which were comparable to the earlier joint assessment, were purposely left out because they provided only data of marginal tabular value. However, when individual elements were deemed substantive, they were singularly discussed in the narrative of Chapter IV.

Table F.1. Lieutenant Colonels by Gender, Ethnic Background, Management Level, and Below-the-Zone Promotion Selection (N=111)

Category	N	Percent of Sample
Gender (N=111)		
Male	106	96
Female	5	5
Ethnic Background (N=111)		
Black Non-Hispanic	1	1
White, Non-Hispanic, Caucasian, European, Middle Eastern, North African	110	99
Management Level* (N=111)		
Level 3	16	14
Level 2	34	31
Level 1	61	55
Below-the-Zone (BTZ) Promotion Selection (N=18)		
To Lieutenant Colonel	14	13
To Major	4	4

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Table F.2. Lieutenant Colonel Brain Dominant Management Styles (In General)(N=111)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left	50	55	8.76	1.70
Right	2	2	7.00	1.41
Integrated	38	42	8.31	1.41
Indeterminate	11	12		

Table F.3. Lieutenant Colonel Brain Dominant Management Styles (By Gender)(N=111)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=55; 50%)				
Male	48	53	8.76	1.72
Female	2	2	9.00	1.41
Right (N=2; 2%)				
Male	2	2	7.00	1.41
Female	0	0	N/A	N/A
Integrated (N=42; 38%)				
Male	35	39	8.26	1.39
Female	3	3	9.00	1.73
Indeterminate	11	12		

Statistical tests:

1. Comparison of means; right-brain; insufficient data points.

2. Comparison of means; integrated-brain; Wilcoxon Rank Sum Test, 2-tail, P .4491, no statistically significant difference.

Table F.4. Lieutenant Colonel Brain Dominant Management Styles (By Management Level*)(N=111)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=55; 50%)				
Level 3	87	9	8.67	1.73
Level 2	14	15	8.73	1.91
Level 1	28	31	8.81	1.64
Right (N=2; 2%)				
Level 3	1	1	8.00	N/A
Level 2	1	1	6.00	N/A
Level 1	0	0	N/A	N/A
Integrated (N=42; 38%)				
Level 3	5	5	7.80	1.10
Level 2	13	14	8.86	1.51
Level 1	21	23	8.09	1.35
Indeterminate	11	12		

Statistical Tests:

1. Comparison of means; right-brain; insufficient data points.

2. Comparison of means; integrated-brain; One Way ANOVA, F 1.74, df 2, P .1888; no statistically significant difference.

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Table F.5. Lieutenant Colonel Brain Dominant Management Styles (By Below-the-Zone Promotion Selection)(N=18)

Brain Dominance	Percent of Selectees	N	Mean	Std Dv
Left (N=8; 44%)				
To Ltc	33	6	9.40	2.07
To Maj	11	2	10.50	3.54
Right (N=1; 6%)				
To Ltc	0	0	N/A	N/A
To Maj	6	1	8.00	N/A
Integrated (N=8; 44%)				
To Ltc	44	8	8.86	1.77
To Maj	0	0	N/A	N/A
Indeterminate	6	1		

Statistical Tests:

1. Comparison of means, right-brain; insufficient data points.

2. Comparison of means; integrated-brain; insufficient data points.

Table F.6. Lieutenant Colonel Potential Abilities (By Management Level)(N=111)

Potential Ability	Percent of Sample	N	Mean	Std Dv
Thinking (N=81; 73%)				
Level 3	10	11	9.00	2.15
Level 2	23	26	9.89	1.53
Level 1	40	44	9.36	1.57
Intuition (N=23; 21%)				
Level 3	3	3	10.67**	0.06
Level 2	5	5	9.80	2.17
Level 1	14	15	8.60**	1.45
Indeterminate	6	7		

Statistical Test: Comparison of means; intuition; Kruskal-Wallis ANOVA, KW 4.4706, df 2, P .0935; statistically significant difference exists.

* P<.1
** P<.05
*** P<.01
**** P<.001

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Table F.7. Lieutenant Colonel Potential Abilities (By Below-the-Zone Promotion Selection)(N=18)

Potential Ability	Percent of Selectees	N	Mean	Std Dv
Thinking (N=10; 56%)				
To Ltc	44	8	9.57	1.90
To Maj	11	2	10.00	2.83
Intuition (N=6; 33%)				
To Ltc	22	4	9.67	1.56
To Maj	11	2	9.00	2.83
Indeterminate	11	2	N/A	N/A

Statistical Test: Comparison of means; Intuition; Wilcoxon Rank Sum Test; P 1.000; no statistically significant difference.

Table F.8. Lieutenant Colonel Occupation Satisfaction (By Brain Dominant Management Style)(N=111)

Brain Dominance	Like Occupation Yes	No	AFSC's Responding No
Left (N=55; 50%)			
Number	43	12	0002, 1555, 2716 (4x), 4916 (2x), 4996, 6616 (2x), 7316
Percent	78	22	
Right (N=2; 2%)			
Number	1	1	2716
Percent	50	50	
Integrated (N=42; 38%)			
Number	33	9	0026 (3x), 1455, 2225 (2x), 6011, 7416, 9756
Percent	79	21	
Indeterminate (N=12; 11%)			

Statistical Test: Management Style and Satisfaction; Chi Square .9134, df 2, P .6334; no statistically significant dependency.

Table F.9. Lieutenant Colonel Occupation Satisfaction (By Potential Abilities)(N=111)

Potential Ability	Like Occupation Yes	No	AFSC's Responding No
Thinking (N=81; 73%)			
Number	62	19	0002, 0026 (2x), 1455, 1555, 2225 (2x), 2716 (4x), 4916 (2x), 4996 6011, 6411, 6616 (2x), 7316,
Percent	77	23	
Intuition (N=23; 21%)			
Number	19	4	0026, 2716, 7416, 9756
Percent	83	17	
Indeterminate (N=7; 6%)			

Statistical Test: Potential Ability and Satisfaction; Chi Square .3826, df 1, p .5362; no statistically significant dependency exists.

Appendix G. Statistical Data By Grade of Major

The data presented in the following selected tables are exclusively on majors and are in equivalent tabular form as found earlier in the joint assessment of colonels, lieutentant colonels, and majors. Several tables on majors, which were comparable to the earlier joint assessment, were purposely left out because they provided only data of marginal tabular value. However, when individual elements were deemed substantive, they were singularly discussed in the narrative of Chapter IV.

Table G.1. Majors by Gender, Ethnic Background, Management Level, and Below-the-Zone Promotion Selection (N=86)

Category	N	Percent of Sample
Gender (N=86)		
Male	75	87
Female	11	13
Ethnic Background (N=86)		
American Indian/Alaskan Native	2	2
Latin American, Puerto Rican, Cuban, Other Hispanic	1	1
White, Non-Hispanic, Caucasian, European, Middle Eastern, North African	83	97
Management Level* (N=86)		
Level 3	1	1
Level 2	14	16
Level 1	71	83
Below-the-Zone (BTZ) Promotion Selection (N=10)		
To Major	10	12

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Table G.2. Major Brain Dominant Management Styles (In General)(N=86)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left	41	35	8.06	1.31
Right	2	2	7.00	1.44
Integrated	50	43	8.44	1.59
Indeterminate	7	6	N/A	N/A

Table G.3. Major Brain Dominant Management Styles (By Gender)(N=86)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=35; 41%)				
Male	37	32	8.09	1.35
Female	4	3	7.67	0.06
Right (N=2; 2%)				
Male	2	2	7.00	1.41
Female	0	0	N/A	N/A
Integrated (N=43; 50%)				
Male	41	35	8.66	1.66
Female	9	8	7.50	0.76
Indeterminate	7	6		

Statistical tests:

1. Comparison of means; right-brain; insufficient data points.

2. Comparison of means; integrated-brain; Wilcoxon Rank Sum Test, 2-tail, P .7416, no statistically significant difference.

Table G.4. Major Brain Dominant Management Styles (By Management Level*)(N=86)

Brain Dominance	Percent of Sample	N	Mean	Std Dv
Left (N=35; 41%)				
Level 3	1	1	7.00	N/A
Level 2	4	3	8.00	1.00
Level 1	36	31	8.10	1.35
Right (N=2; 2%)				
Level 3	0	0	N/A	N/A
Level 2	1	1	6.00	N/A
Level 1	1	1	8.00	N/A
Integrated (N=43; 50%)				
Level 3	0	0	N/A	N/A
Level 2	9	8	8.50	0.93
Level 1	41	35	8.43	1.72
Indeterminate	7	6		

Statistical Test: Insufficient data points.

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Table G.5. Major Brain Dominant Management Styles (By Below-the-Zone Promotion Selection)(N=10)

Brain Dominance	Percent of Selectees	N	Mean	Std Dv
Left				
To Maj	60	6	8.00	1.27
Right				
To Maj	0	0	N/A	N/A
Integrated				
To Maj	40	4	8.75	0.96
Indeterminate	0	0		

Statistical Test: Not applicable (i.e., only one mean)

Table G.6. Major Potential Abilities
(By Management Level)(N=86)

Potential Ability	Percent of Sample	N	Mean	Std Dv
Thinking (N=47; 55%)				
Level 3	0	0	N/A	N/A
Level 2	8	7	10.71	1.70
Level 1	47	40	9.38	1.69
Intuition (N=28; 33%)				
Level 3	1	1	8.00	N/A
Level 2	6	5	9.00	2.35
Level 1	26	22	9.41	1.76
Indeterminate	13	11		

Statistical Test: Insufficient data points.

Legend: *Management Levels

Management Level 3: Commander (or Deputy Commander), Group level and above; Director (or (Deputy Director), MAJCOM (or equivalent) and above; other equivalent positions.

Management Level 2: Commander (or Deputy Commander) below Group level; Division Chief, Joint or Departmental (or equivalent) level; other equivalent positions.

Management Level 1: Division Chief, MAJCOM (or equivalent) and below; staff officer (all echelons); other equivalent positions.

Table G.7. Major Potential Abilities
(By Below-the-Zone Promotion Selection)(N=10)

Potential Ability	Percent of Selectees	N	Mean	Std Dv
Thinking				
To Maj	40	4	10.00	1.41
Intuition				
To Maj	50	5	9.00	1.58
Indeterminate	10	1		

Statistical Test: Not applicable (i.e., only one mean)

Table G.8. Major Occupation Satisfaction
(By Brain Dominant Management Style)(N=86)

Brain Dominance	Like Occupation Yes	No	AFSC's Responding No
Left (N=35; 41%)			
Number	29	6	1425, 1545, 2245 (2x), 6416 7316
Percent	83	17	
Right (N=2; 2%)			
Number	2	0	
Percent	100	0	
Integrated (N=43; 50%)			
Number	35	8	0726, 2245, 2295 6516, 7046 (2x), 8016, 9756
Percent	81	19	
Indeterminate (N=6; 7%)			

Statistical Test: Insufficient data points.

Table G.9. Major Occupation Satisfaction
(By Potential Abilities)(N=86)

Potential Ability	Like Occupation Yes	No	AFSC's Responding No
Thinking (N=47; 55%)			
Number	41	6	0726, 2245, 7046, 8016 (2x), 9756
Percent	87	13	
Intuition (N=28; 33%)			
Number	22	6	1425, 1545, 2245 6416, 7046, 7316
Percent	79	21	
Indeterminate (N=11; 13%)			

Statistical Test: Potential Ability and Satisfaction; Chi Square .98, df 1, P .3223; no statistically significant dependency exists.

Bibliography

1. Ackoff, Russell L. "The Development of Operations Research as a Science," Operations Research, 6: 265-266 (nm 1956).

2. Agor, Weston H. "How Top Executives Use Their Intuition to Make Important Decisions," Business Horizons 29: 49-53 (January/February 1986).

3. -----. "Intuition as a Brain Skill in Management," Public Personnel Management, 14: 15-24 (Spring 1985).

4. -----. Intuitive Management. Integrating Left and Right Brain Management Skills. Englewood Cliff NJ: Prentice-Hall, Inc, 1984.

5. -----. "The Logic of Intuition: How Executives Make Important Decisions," Organizational Dynamics, 14: 5-18 (Winter 1986).

6. -----. The Logic of Intuitive Decisionmaking: A Research-based Approach for Top Management. Westport CT: Greenwood Press, Inc., 1986.

7. -----. "Manage Brain Skills to Increase Productivity," Personnel, 63: 42-46 (August 1986).

8. -----. "Tomorrow's Intuitive Leaders," Futurist, 17: 49-53 (August 1983).

9. -----. "Unlocking Your Intuition," Management World, 14: 8-10 (May 1985).

10. -----. "Using Intuition to Manage Organizations in the Future," Business Horizons, 27: 49-54 (July/August 1984).

11. Allio, Robert J. "Interviewing Professor Mintzberg's 'Right Brain,'" Planning Review, 5: 8-11, 22 (nm 1977).

12. Alper, Joseph S. "Sex Differences in Brain Asymmetry: A Critical Analysis," Feminis Studies 11: 7-37 (Spring 1985).

13. Appleby R.C. and Irving Burstinger. The Essential Guide to Management. Englewood Cliff NJ: Prentice-Hall, Inc., 1981.

14. Arnold, John D. Make Up Your Mind. New York: AMACOM, 1978.

15. Ayer, Alfred T. The Problem of Knowledge. Baltimore: Penguin Books LTD, 1957.

16. Barnard, Chester I. The Functions of the Executive. Cambridge MA: Harvard University Press, 1968.

17. Bassow, A.H. David Hume. Middlesex, England: Pelican Books, 1958.

18. Bastick, Tony. Intuition. How We Think and Act. New York: John Wiley and Sons, 1982.

19. Bennis, Warren. "The Four Competencies of Leadership," Training and Development Journal, 38: 15-19 (nm 1984).

20. Blake, Robert R. and Jane S. Mouton. The Managerial Grid. Houston: Gulf Publishing Co., 1964

21. Bloom, Benjamin S. (ed.) Taxomony of Educational Objectives, Cognitive Domain. New York: David McKay Co., Inc., 1971.

22. Brewster, Ghiselin (ed.) The Creative Process. New York: Mentor, 1952.

23. Bryden, M.P. Laterality Functional Asymmetry in the Intact Brain. New York: Academic Press, 1982.

24. Bunge, Mario. Intuition and Science. Englewood Cliffs NJ: Prentice-Hall, Inc., 1962.

25. Butler, S.R. and A. Glass. "Asymmetries in the Electroencephalogram Associated With Cerebral Dominance," Electroencephalography and Clinical Neurophysiology, 36: 481-491 (nm 1974).

26. Cade, C. Maxwell and Nona Coxhead. The Awakened Mind. New York: Delacorte Press, 1979.

27. Campbell, Joseph. The Portable Jung. New York: Penguin Books, 1984.

28. Cook, Thomas M. and Robert A. Russell. Introduction to Management Science (Third Edition). Englewood Cliffs NJ: Prentice-Hall, Inc., 1985.

29. Coulson, Louis T. and Alison G. Strickland. "The Minds at the Top: An Analysis of the Thinking Style Preferences of Superintendents of Schools and Chief Executive Officers," The Journal of Creative Behavior, 17: 163-174 (nm 1983).

30. Daft, Richard L. and Richard M. Steers. Organizations. A Micro/Macro Approach. Glenview IL: Scott, Foresman and Company, 1986.

31. Davis, Gordon B. and Margrethe H. Olson. Management Information Systems. New York: McGraw-Hill Book Company, 1985.

32. Dean, Douglas and others. Executive ESP. Englewood Cliffs NJ: Prentice-Hall, Inc, 1974.

33: De Bono, Edward. Lateral Thinking: Creativity Step By Step. New York: Harper and Row, Publishers, 1970.

34. Delaney, Col James H., Director of Administration, HQ USAF. "The Creative Leader/Manager." Address to the Administration Officer and Administration Management Officer Courses. 3400 Technical Training Group (ATC), Keesler AFB MS, 8 May 1985.

35. Delaney, Ted. "Psychologist Finds Generals, Corporate Leaders Much Alike," Gazette Telegraph, nv: B1-B2 (November 1988).

36. Department of the Air Force. Basic Aerospace Doctrine of the United States Air Force. AFM 1-1. Washington: HQ USAF, 16 March 1984.

37. -----. Fact Sheet: Demographic Information. Washington: HQ USAF/PA, September 1988.

38. -----. A Guide for the Development of the Attitude and Opinion Survey. Washington: HQ USAF/ACM, October 1974.

39. Dewey, John. Art As Experience. New York: Capricorn Books, 1943.

40. Drucker, Peter F. The Effective Executive. New York: Harper and Row Publishers, 1967.

41. -----. The Practice of Management. New York: Harper and Brothers, 1954.

42. Eaton, Ralph M. (ed.) Descartes Selections. New York: Charles Scribners Sons, 1927.

43. Eiseley, Loren. The Immense Journey. New York: Harcourt, Brace, and World, Inc., 1964.

44. Eliot, John. Human Development and Cognitive Processess. New York: Holt, Rinehart, and Winston Inc., 1971.

45. Elstein, Arnold T. Decision Science and Cognitive Psychology. New York: Harper and Row, 1984.

46. Emory, C. William. Business Research Methods (Third Edition). Homewood IL: Irwin, 1985.

47. Fastabend, Major David A. "Fighting By the Numbers: The Role of Quantification in Tactical Decision-making." Defense Technical Information Center (DITC) Report No. AD-A191438. Defense Logistics Agency. Cameron Station VA, 1987.

48. Gandy, Peggy, Air Force Survey Controller. Personal Interview. Air Force Manpower and Personnel Center, DMPYI, Randolph AFB TX, 13 December 1988.

49. George, Claude S. The History of Management Thought. Englewood Cliffs NJ: Prentice-Hall, Inc., 1972

50. Geschwind, Norman. "Specializations of the Human Brain," Scientific American, 241: 180-199 (nm 1978).

51. Goldberg, Philip. The Intuitive Edge. Los Angeles: Jeremy P. Tarcher, Inc., 1983.

52. Goldstein, Marilyn and others. "Management on the Right Side of the Brain," Personnel Journal, 6:40-45 (November 1985).

53. Goldstein, Robert P. The Intuitive Child. New York: Random House, Inc., 1983.

54. Goodspeed, Bennett W. "Different Styles of Analysis Imperative to Business," American Banker, 18: 28-30 (November 1981).

55. Hall, Calvin S. and Gardner Lindzey. Theories of Personality. New York: John Wiley and Sons, Inc., 1957.

56. Hall, Calvin S. and Vernon J. Nordby. A Primer of Jungian Psychology. New York: New American Library, 1973.

57. Hallion, Richard P. "Girding For War: Perspectives on Research and Development, Acquisition, and the Decisionmaking Environment of the 1980's," Air University Review, 37: 46-62 (September-October 1986).

58. Hamilton, Charles H. Personal Correspondence. Air Force Manpower and Personnel Center, Randolph AFB OH, 24 January 1989.

59. Hampden-Turner, Charles. Maps of the Mind. New York: Macmillan Publishing Company, 1981.

60. Heisenberg, Werner. Physics and Philosophy. New York: Harper and Brothers, 1958.

61. Herrman, Ned. "The Brain and Management Learning," Training And Development Journal, 22: 11-16 (October 1981).

62. Hirsh, Sandra K. and Jean M. Kummerow. Introduction to Type in Organizational Settings. Palo Alto CA: Counsulting Psychologists Press, 1987.

63. Huber, George P. "Cognitive Style as a Basis for MIS and DSS Designs: Much Ado About Nothing?," Management Science, 29: 567-582 (May 1983).

64. Ironson, David S. "Your Brain. Using Both Halves for Enhanced Communications," International Television, 3: 18-21 (July 1984).

65. James, William. The Varieties of Religious Experience. New York: Random House, 1976.

66. Jenkins, A. Milton, L.J. Buchan Distinguished Professor, School of Economics and Management, Oakland University. Research Methodologies and MIS Research. Unpublished, copyrighted, Discussion Paper No. 277. Rochester MI, November 1984.

67. Jones, Manley H. Executive Decision Making. Homewood IL: Richard D. Irwin, Inc., 1962.

68. Jung, Carl G. Man and His Symbols. New York: Dell Publishing Company Inc., 1983.

69. -----. Psychological Types. New York: Harcourt, Brace, and Co., Inc., 1926.

70. Kaplan, Robert S. "The Evolution of Management Accounting," The Accounting Review, 59: 390-417 (July 1984).

71. Katz, Daniel and Robert L. Kahn. The Social Psychology of Organizations. New York: John Wiley and Sons, Inc., 1966.

72. Keen, Peter G., and Michael S. Morton. Decision Support Systems: An Organizational Perspective. Reading MA: Addison-Wesley Publishing Co., Inc., 1978.

73. Kerlinger, Fred N. Foundations of Behavioral Research. New York: Holt, Rinehart and Winston, Inc., 1964.

74. Koester, Robert and Fred Luthans. "The Impact of the Computer on the Choice Activity of Decisionmakers: A Replication With Actual Users of Computerized MIS," Academy of Management Journal, 22: 416-422 (June 1979).

75. Koestler, Arthur. The Act of Creation. New York: The MacMillan Co., 1964.

76. Kubie, Lawrence S. Neurotic Distortion of the Creative Process. New York: The Noonday Press, 1958.

77. Lamkin, Martha D. "Power: How to Get It, Keep It, and Use It Wisely," Vital Speeches, 19: 151-154 (December 1986).

78. Laszlo, Violet S. The Basic Writings of C.G. Jung. New York: Random House, 1959.

79. Leavitt, Harold J. "Beyond the Analytic Manager," California Management Review, 17: 5-12 (Spring 1975).

80. Lee, William. Decision Theory and Human Behavior. New York: Wiley and Sons, Inc., 1971.

81. Lehrer, Robert N. White Collar Productivity. New York: McGraw-Hill, 1983.

82. Leigh, Jason. "Executives and The Personality Factor," Sky, nv: 34-37 (May 1985).

83. Levey, Stewart D. Administration: A Managerial Perspective. Philadelphia: J.B. Lippincott Company, 1973.

84. Levy, Jerre. "Research Synthesis on Right and Left Hemispheres: We Think With Both Sides of The Brain," Educational Leadership, 40: 66-71 (January 1983).

85. Livingston, Joan S. "Myth of the Well-educated Manager," Harvard Business Review, 49: 79-89 (January/February 1971).

86. Lucas, Henry C. "A Descriptive Model of Information Systems in the Context of the Organization," Data Base 5: 27-39 (Winter 1973).

87. Lyons, Michael L. "The DP Psyche," Datamation, 31: 103-105, 108, 110 (August 1985).

88. MacLean, Paul D. A Triune Concept of the Brain and Behavior. Toronto: University of Toronoto Press, 1969.

89. Maritain, Jacques. Creative Intuition in Art and Poetry. Cleveland and New York: The World Publishing Co, 1954.

90. Markus, M. Lynne and Daniel Robey. "The Organizational Validity of Management Information Systems," Human Relations, 36: 203-226 (1983).

91. Masters, Charles S. (ed.) The Oxford Etymological Dictionary. London, England: Porter and Sons, 1983.

92. McClave, James T. and P. George Bensen. Statisitics for Business and Economics (Third Edition). San Francisco: Dellen Publishing Company, 1985.

93. McGregor, D. The Human Side of Enterprise. New York: McGraw-Hill Book Co., 1960.

94. McKendrick, Joseph and others. "The Generalist Productivity: Calls for Redirection," Management World 12: 21-24 (January 1983).

95. McKenney, James L. and Peter G.W. Keen. "How Managers' Minds Work," Harvard Business Review, 52: 79-90 (May/June 1974).

96. Meyers, Marilyn and Barry D. Smith. "Hemispheric Asymmetry and Emotions: Effects of Nonverbal Affective Stimuli," Biological Psychology, 22: 11-22 (nm 1986).

97. Miller, William H. "How CEOs Make Decisions," Industrial Week, 32: 41-44 (February 1987).

98. Mintzberg, Henry. "Planning on the Left Side and Managing on the Right," Harvard Business Review, 54: 49-58 (July/August 1976).

99. Montgomery, Geoffrey. "The Mind in Motion," Discover, 10: 58-61, 64-66, 68 (March 1989).

100. Myers, Isabel B. Gifts Differing. Palo Alto CA: Consulting Psychologists Press, Inc, 1980.

101. -----. The Myers-Briggs Type Indicator Manual. Palo Alto CA: Counsulting Psychologists Press, Inc., 1962.

102. Myers, Isabel B. and Mary H. McCaulley. Manual: A Guide to the Development and Use of the Myers Briggs Type Indicator. Palo Alto CA: Counsulting Psychologists Press, 1985.

103. Myers, John T. "Hemisphericity Research: An Overview With Some Implications for Problem Solving," Journal of Creative Behavior, 16: 197-211 (nm 1982).

104. Myers, Michele T. and Gail E. Myers. Managing by Communication: An Organizational Approach. New York: McGraw-Hill, Inc., 1982.

105. N.H. Analytical Software Group. Statistix II. Software Manual. Roseville MN, undated.

106. Nothing, Lt Col David J. "Challenge to Excellence," Air University Review, 38: 69-74 (January-March 1987).

107. Ott, Lyman. An Introduction to Statistical Methods and Data Analysis (Third Edition). Boston: PWS-Kent Publishing Company, 1988.

108. Parnes, Sidney J. and Harold F. Harding. (ed.) A Source Book for Creative Thinking. New York: Charles Scribner's Sons, 1962.

109. Pascale, Richard T. and Anthony G. Athos. The Art of Japanese Management--Applications for Executives. New York: Simon and Schuster, 1981.

110. Peters, Thomas J. and Robert H. Waterman. In Search of Excellence: Lessons From America's Best Run Companies. New York: The MacMillan Company, 1982.

111. Piatt, John G. "Brain Processing Preferences: Key to an Organization's Success," NASSP Bulletin, 67: 64-69 (December 1983).

112. Randall, John H. Aristotle. New York: Columbia University Press, 1960.

113. -----. The Career of Philosophy. New York: Columbia University Press, 1962.

114. Restak, Robert M. The Brain: The Last Frontier Garden City NY: Doubleday and Company, Inc, 1979.

115. Reynolds, Cecil R. and others. "Black-white IQ Discrepancies May be Related to Differences in Hemisphercity," Contemporary Educational Psychology, 6:180-184 (April 1981).

116. Rhine, Joseph B. The Reach of the Mind. New York: William Sloane Associates, Inc., 1967.

117. Ringle, William M. "The American Who Remade 'Made in Japan': W. Edwards Deming," Nation's Business, 69: 67-70 (February 1981).

118. Roach, Ben. "Organizational Decision-Makers: Different Types for Different Levels," Journal of Psychological Types, 12: 16-24 (1986).

119. Robbins, Stephen P. The Administrative Process. Englewood Cliff NJ: Prentice-Hall, Inc., 1976.

120. Robey, Daniel and William Taggart. "Human Information Processing in Information and Decision Support Systems," MIS Quarterly, 6: 61-73 (June 1982).

121. Rogers, Michael. "Mimicking the Human Mind," Newsweek, 110: 52-53 (July 20, 1987).

122. Rosencrans, Lt Gen Evan W. "The Essence of Leadership," Airpower Journal, 2: 6-7, 27 (Spring 1988).

123. Ross, Arnold C.. "Brain Hemispheric Functions and the Native American," Journal of American Indian Education, 18: 2-5 (May 1982).

124. Rowan, Roy. The Intuitive Manager. New York: Berkley Books, 1986.

125. Rugg, Harold. Imagination. New York: Harper and Row, 1963.

126. Ruggiero, Vincent R. The Art of Thinking: A Guide to Critical and Creative Thought. New York: Harper and Row, Publishers, 1984.

127. Russell, Bertrand. A History of Western Philosophy. New York: Simon & Schuster, 1963.

128. Salk, Jonas. Anatomy of Reality. New York: Columbia University Press, 1983.

129. Sargent, Alice G. The Androgynous Manager. New York: Amacom, 1981.

130. Scheffler, Israel. Conditions of Knowledge. Glenview IL: Scott Foresman Co., 1965.

131. Seares, Col David F. "Adaptive Mission Planning," Air University Review, 38: 62-68 (January-March 1987).

132. Seidel. George L. The Crisis of Creativity. Notre Dame: University of Notre Dame Press, 1966.

133. Shetty, Y. K. "Key Elements of Productivity Improvement Programs," Business Horizons, 25: 15-22 (March/April 1982).

134. Snedecor, G.W. amd W.G. Cochran. Statistical Methods (Seventh Edition). Ames IA: The Iowa State University Press, 1980.

135. Sperling, David. "Best Executives Know Intuition Supplements Logic," USA Today, 8: 2B (August 22, 1984).

136. Sperry, R.W. "Hemisphere Deconnection and Unity in Conscious Awareness," American Psychologist, 23: 723-733 (nm 1968).

137. Springer, Sally P. and George Deutsch. Left Brain, Right Brain. New York: W.H. Freeman and Company, 1981.

138. Stice, James E. (ed.) Developing Critical Thinking and Problem-Solving Abilities. San Francisco: Jossey-Bass, Inc., 1987.

139. Stockhammer, Morris. (ed.) Plato Dictionary. New York: Philosophical Library, Inc, 1963.

140. Stoner, James A. Management. Englewood Cliffs NJ: Prentice-Hall Inc., 1978.

141. Szilagyi, Andrew D. and Marc J. Wallace. Organizational Behavior and Performance. Chicago: Scott, Foresman and Co., 1983.

142. Taggart, William A. and Paul E. Torrance. Human Information Processing Survey Administrator's Manual. Bensenville IL: Scholastic Testing Service, 1984.

143. United States Code, Title 10, Section 8062, Armed Forces. St Paul MN: West Publishing Co, 1959.

144. Vaughan, Francis E. Awakening Intuition. Garden City NY: Anchor Press, 1979.

145. Vinnicombe, Susan. "What Exactly Are the Differences in Male and Female Working Styles?," Women in Management Review, 3: 13-21 (nm 1987).

146. Webber, Ross A. Management. Homewood IL: Richard D. Irwin, Inc., 1975.

147. Weintraub, Pamela. "The Brain; His and Hers," Discover, 7: 15-20 (April 1981).

148. Westcott, Malcolm R. Toward a Psychology of Intuition. New York: Holt, Rinehart and Winston, Inc., 1968.

149. Wild, John. (ed.) Spinoza Selections. New York: Charles Scribner's Sons, 1958.

150. Wild K.W. Intuition. Cambridge: Cambridge University Press, 1938.

151. Wolfle, Dael. (ed.) The Discovery of Talent. Cambridge MA: Harvard University Press, 1969.

152. Zakariya, Sally B. "His Brain, Her Brain," Principal, 12: 46-52 (May 1981).

153. Zdenek, Marilee. The Right-brain Experience: An Intimate Program to Free the Power of Your Imagination. New York: McGraw-Hill, 1983.

154. Zeleny, Milan, "Notes, Ideas and Techniques: New Vistas of Management Science," Computers and Operations Research, 2: 121 (Spring 1975).

Vita

Major Norman L. Watson, USAF, was commissioned on 29 June 1978 and served in various executive officer and information management positions in Strategic Air Command, Air Training Command, Headquarters, United States Air Force, and The Organization of the Joint Chiefs of Staff. He entered the School of Systems and Logistics, Air Force Institute of Technology, Air University, in May 1989.

Permanent Address: Postal Route 7
Hanalea, New Zealand

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) AFIT/GIR/LSM/89D-12	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION School of Systems and Logistics 6b. OFFICE SYMBOL (If applicable) AFIT/LSY	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Air Force Institute of Technology Wright-Patterson AFB OH 45433-6583	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)
THE ROLE OF INTUITION IN THE DECISIONMAKING PROCESSESS OF UNITED STATES AIR FORCE FIELD GRADE OFFICERS

12. PERSONAL AUTHOR(S)
Norman L. Watson, B.A., M.Dv., Major, USAF

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
MS Thesis	FROM _____ TO _____	1989 December	272

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	
05	08		Cognition, Creativity, Judgment, Performance, Reasoning, Psychological Tests (EG)
05	09		

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

Thesis Advisor: Dennis E. Campbell
Associate Professor of Logistics Management
Department of Logistics Management

Approved for public release: IAW AFR 190-1.

LARRY W. EMMELHAINZ, Lt Col, USAF 12 Jan 90
Director of Research and Consulting
Air Force Institute of Technology (AU)
Wright-Patterson AFB OH 45433-6583

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
Dennis E. Campbell, Assoc. Professor	(513) 255-5023	LSM

DD Form 1473, JUN 86 *Previous editions are obsolete.*

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

The study examined the relationship of intuition to creativity and innovation; the impact of that relationship on effective decisionmaking; and the need for creativity and innovation in management and decisionmaking.

A random stratified sample of 304 United States Air Force field grade officers were surveyed. Brain hemisphere preference (i.e., left-, right-, and integrated-brain) in actual on-the-job decisionmaking as well as dichotomous potential ability (thinking versus intuition), which may not necessarily be utilized on the job, were measured via an instrument designed by Dr. Weston H. Agor of the University of Texas at El Paso.

The research determined that Air Force field grade officers are predominately left- and integrated-brain dominant. Characteristically, they use analytical, logical, and rational thinking in their decisionmaking processes and are prone to be more capable of identifying the problem, evaluating the alternatives to the problem, and selecting a solution, rather than at determining alternative solutions.

Furthermore, the research determined that right-brain dominance is minimal among Air Force field grade officers; typically intuitive ethnic groups have adopted the logical, analytical, and objective cognitive predisposition of the Air Force environment, though not at identical rates; a right-brain dominant management style is atypical of below-the-zone promotion; there is greater underlying potential intuitive ability than is actually practiced on the job; and other related findings.

Several recommendations were made concerning the need to foster right-brain skills among Air Force field grade officers to more adequately balance the brain dominance of the subject population and to more effectively move that population toward a goal of integrated-brain dominance. That dominance, which selectively uses left- and right-brain skills, characterizes managers that make their decisions by use of facts and intuition, after pursuing available information and receiving inputs from the management resources and personnel in an organization. Such is considered the ideal management style.